JUL 17 1944

ENGINEERING NEWS-RECORD

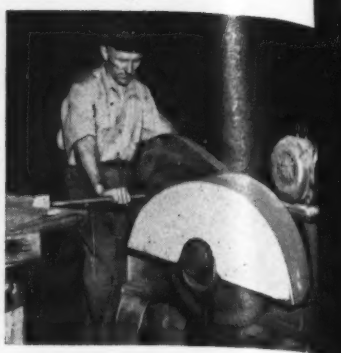
JULY 13, 1944

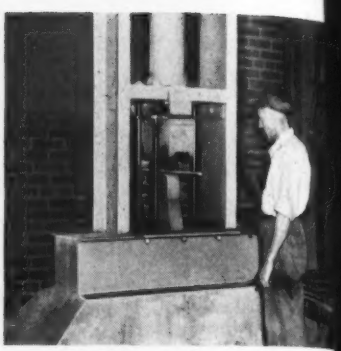
EROSION AT COULEE: Examination of the spillway bucket at Grand Coulee Dam shows considerable damage created by erosive forces that are measured in millions of horsepower. What was found, and the plans to repair the bucket, are described in this issue.

Also Featured: AIRSTRIP CONSTRUCTION WITH CORAL

BYERS WROUGHT IRON

helps the District of Columbia solve its MANHOLE LADDER STEP Problem





Engineering ingenuity and Byers Wrought Iron again came to the rescue when the District of Columbia Sewer Department encountered a manhole ladder step problem. The way it was solved makes an interesting story, and may provide a helpful tip.

Ordinary material, which depended on galvanizing for corrosion resistance, was previously used. The steps were formed by local heating of the bending zone and hammering around in a vice. This was a slow process and one that resulted in considerable breakage and often left unrelieved stresses that contributed to early failure. When spelter became critical, the engineers looked about for other material . . . and tried wrought iron.

Wrought Iron bar stock, ⅝-inch square, was cut to length and shaped in a shop-constructed forming press. This piston was taken from a clamshell bucket of a dredge and operated by shop compressed air, controlled by a two-way valve. Two rollers were incorporated in the upper die to avoid pulling of the metal. Steps are formed complete in one operation, with no breakage difficulties. Several thousand steps per day can be produced when needed.

Corrosion of manhole ladder steps is a problem encountered in all sections of the country, and in some instances expensive alloys have been utilized in an attempt to eliminate difficulties. Many engineers, however, have remembered that no undue trouble was experienced in past years, when wrought iron was almost universally installed, and have resumed use of this material. At least one state has standardized on wrought iron, and the municipalities that regularly apply it are too numerous to itemize.

The unusual resistance of wrought iron to sewer gases and to the dank, moisture-laden atmosphere encountered in almost all underground tunnels, is the direct result of its unique structure. Wrought Iron consists of a body of high-purity iron through which tiny fibers of glass-like silica slag are threaded. These threads of "iron-glass" act to prevent the pitting that causes premature weakening and failure of ordinary materials. They halt and deflect corrosive attack, and also anchor the protective scale that shields the underlying metal.

If you have a step problem, we can arrange to show you a Service-Gram on Wrought Iron for Manhole Ladder Steps. Our Engineering Service Department will also be glad to give you any information you desire on present applications and performance of the material.

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JOHN ABBINK, *Publisher*

WALDO G. BOWMAN, *Editor* ALBERT E. PAXTON, *Manager*

Vol. 133 JULY 13, 1944 No. 2

COMING NEXT

• Among the first airborne troops to land in Normandy were engineers to rehabilitate captured airfields. They were but part of a little known branch of the armed forces of today, the Aviation Engineers. In the July 27 issue the organization, training and equipment of these units will be described.

• Most versatile of all the equipment developed for use in this war are the steel-box pontoon units developed by the Navy. They are used to build wharves, barges, and drydocks, and occasionally for bridges or storage tanks. Typical examples of how they are being used in the South Pacific are given in another of N. A. Bowers' reports on his trip to that region.

• Structural designers will find much to stimulate their thinking and some shortcuts for their work in "Simplified Rigid Frame Design", to be published in the July 27 issue.

• Most of Paducah, Ky., was flooded when the Ohio River went on a rampage in 1937. Today, the city can look forward to the future with no fear of a repetition of that disaster as it soon will be protected by a system of levees, flood walls and pumping stations. Progress on the work will be reported July 27.

THINGS TO COME

• How heavy construction equipment and freight are unloaded on hostile shores is told in another of N. A. Bowers' accounts of activities of the Seabees in Pacific areas, to be published August 10.

• Wilmington, N. C., for years has been troubled by the inadequacy of its water supply and by the high salt content of the water, taken from the Cape Fear River near its mouth. To correct this situation, the city has gone inland for a new supply, an operation that involved some unusual pipe-line construction, which will be described in a forthcoming issue.

	PAGE
News of the Week	69
Comment and Discussion	76
Editorials	78
Coral Airstrips on Pacific Islands.....N. A. BOWERS	80
Characteristics of Coral Deposits.....HAROLD T. STEARNS	85
Arkansas Rebuilds Roads and Bridges Damaged in Floods	88
Precast Arch Ribs for Auditorium Roof....WILLIAM L. ZEIGLER	89
Milwaukee Approves Public Works Financing	91
Notes on Waterworks Developments	92
Spillway Erosion at Grand Coulee Dam...KENNETH B. KEENER	95
New Design Policies for Arkansas Roads	102
Blackout Tunnel for Locomotive Inspection	105
Use of Twin Bridges Simplifies Design	106
New Sign System for Michigan Highways	108
Reinforcing Brick Arches under Traffic.....R. D. MC GILVRA	109
Mexican Irrigation Program	110
Use of Air-Entraining Agents in Concrete	111
Association Elections and Activities	114
Men and Jobs	118
New Aids to the Constructor	122
Unit Prices	129
Material Prices	130
Construction Reports	191
Manufacturers' Activities	138
New Trade Publications	158
Brief News	172

Number of copies of this issue printed: 35,961

DO YOU WANT AN INDEX?

Due to the paper shortage, no index for the volume just completed, No. 132 (January-June, 1944) will be issued except to subscribers who ask for it. If you want a copy of the index please send in the coupon below.

Editor—Engineering News-Record
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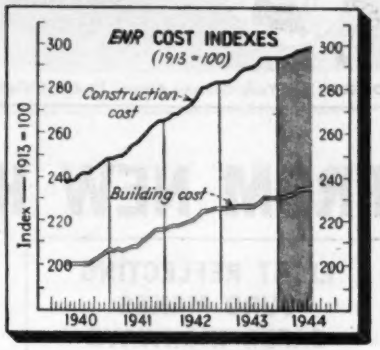
MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

(,000 omitted)	June 1943 (4 wk.)	June 1944 (5 wk.)	% Change†	Six Months 1943 (25 wk.)	Six Months 1944 (26 wk.)	% Change†
Total U. S. Construction	$274,493	$157,811	−54.0	$1,766,252	$891,830	−51.0
Private Construction	72,718	32,569	−64.0	222,484	201,481	−13.0
Public Construction	201,775	125,242	−50.0	1,543,768	690,349	−57.0
Federal	179,819	93,555	−58.0	1,443,407	580,913	−61.0
Total New Productive Capital	$4,644	$16,728	+188.0	$497,066	$443,277	−14.0
Private Investment	4,644	14,378	+148.0	84,583	141,881	+61.0
Federal (non-federal work)	.....	2,350	.....	12,133	56,130	+346.0
Federal (federal work)	.....	.....	.....	400,350	245,266	−41.0
ENR Construction Volume Index, 1913 = 100	204	91	−55.0	211*	100*	−53.0

† *Adjusted for difference in number of weeks reported.* * *Six-month average.*



CONSTRUCTION COSTS . . . WAGE RATES . . . MATERIAL PRICES

	July 1943	July 1944	% Change	Change June to July 1943 June	1943 July	1943 %	Change June to July 1944 June	1944 July	1944 %
ENR Construction Cost Index, 1913 = 100‡	289.92	299.94	+3.5	289.94	289.92	**	298.72	299.94	+0.4
ENR Building Cost Index, 1913 = 100‡	227.89	235.55	+3.4	227.71	227.89	+0.1	235.33	235.55	+0.1

‡ *Does not reflect increased costs due to more overtime, lower efficiency, delivery delays, etc.*

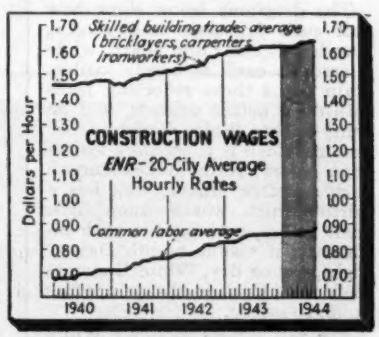
ENR 20-CITIES' AVERAGE

Common Labor	$0.863	$0.882	+2.2	$0.863	$0.863	0	$0.877	$0.882	+0.6
Skilled Labor (Av. 3 trades)	1.617	1.638	+1.3	1.614	1.617	+0.2	1.638	1.638	0
Bricklayers	1.703	1.736	+1.9	1.703	1.703	0	1.736	1.736	0
Structural Ironworkers	1.679	1.694	+0.9	1.671	1.679	+0.5	1.694	1.694	0
Carpenters	1.468	1.484	+1.1	1.468	1.468	0	1.484	1.484	0
Cement, per barrel	$2.60	$2.66	+2.3	$2.61	$2.60	−0.4	$2.65	$2.66	+0.4
Reinforcing steel, cwt.	2.75	2.80	+1.8	2.73	2.75	+0.7	2.79	2.80	+0.4
Structural steel, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.21	1.21	0	1.21	1.21	0	1.23	1.21	−1.6
Lumber, 2x4 Fir, per M ft.	51.13	54.28	+6.2	51.13	51.13	0	54.28	54.28	0
Lumber, 2x4 Pine, per M ft.	44.80	53.09	+18.5	44.85	44.80	−0.1	52.68	53.09	+0.8
Brick, common, per M	15.68	16.52	+5.4	15.68	15.68	0	16.41	16.52	+0.7
Ready-mixed concrete, c. y.	7.37	7.43	+0.8	7.37	7.37	0	7.39	7.43	+0.5
Struct. clay tile, 3x12x12-in.	78.74	80.48	+2.2	78.97	78.74	−0.3	79.97	80.48	+0.6
Paving asphalt, cars, ton	15.22	15.40	+1.2	15.32	15.22	−0.7	15.25	15.40	+1.0

** *Less than .05 percent change.*

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
July, 1944	299.94	144.18	235.55	127.33	.....	.....
June, 1944	298.72	143.59	235.33	127.21	91	40
May, 1944	298.00	143.25	234.80	126.93	100	44
April, 1944	297.70	143.10	234.50	126.76	106	46
Mar., 1944	295.34	141.97	232.32	125.59	103	45
Feb., 1944	295.05	141.83	232.03	125.43	86	38
Jan., 1944	294.57	141.60	231.55	125.17	114	50
Dec., 1943	294.51	141.57	231.49	125.14	103	45
Nov., 1943	294.41	141.52	231.39	125.08	149	65
Oct., 1943	294.31	141.47	231.29	125.03	142	62
Sept., 1943	294.09	141.37	231.20	124.98	155	68
Aug., 1943	291.38	140.07	228.49	123.51	119	52
July, 1943	289.92	139.36	227.89	123.19	175	77
June, 1943	289.94	139.37	227.71	123.09	204	89
1943 (Av.)	289.95	139.38	228.75	123.66	176	77
1942 (Av.)	276.31	132.82	222.39	120.22	553	243
1941 (Av.)	257.84	123.95	211.46	114.32	375	164
1940 (Av.)	241.96	116.31	202.81	109.64	269	118



MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	June 1943	June 1944	% Change	May 1944	% Change May-June
Steel (% operating capacity) A. I. S. I.	96.3	97.1	+0.8	98.8	−1.7

	May 1943	May 1944	% Change	Five Months 1943	Five Months 1944	% Change
Fabricated Structural Steel, tons, A.I.S.C.	78,924	40,557	−48.6	442,194	194,824	−55.9
Cement, thous. bbl., U. S. B. of M.	12,075	8,784	−27.3	52,236	32,484	−37.8
Building Permits, 215 cities, Dun & Bradstreet (,000 omitted)	$48,897	$55,426	+13.4	$190,943	$250,226	+31.0

COST OF LIVING INDEXES . . . . EMPLOYMENT

	May 1943	May 1944	% Change	Apr. 1944	% Change Apr.-May
Cost of Living Index, N. I. C. B.	104.2	104.4	+0.2	104.1	+0.3
Rent (Housing) Index, N. I. C. B.	90.8	90.8	0	90.8	0
Total Employment (est.) thous., B. L. S.	39,674	38,598	−2.8	38,698	−0.3
Constr. Employment (est.) thous., B. L. S.	1,385	688	−50.3	683	+0.7

ENGINEERING CONSTRUCTION CONTRACTS—ENGINEERING NEWS-RECORD—JUNE, 1944

Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs—waterworks, excavation, drainage and irrigation,* $15,000 *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Five Weeks—Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States June 1944	United States Six Months 1944	United States Six Months 1943	Canada
Public Works										
Waterworks	323	573	1,347	563	1,249	307	4,362	13,975	26,360	.....
Sewerage	270	487	2,200	504	481	544	4,486	13,629	19,576	53
Bridges, public	84	124	950	122	481	277	2,038	5,423	9,550	859
Earthwork and waterways	20	222	2,138	243	310	7,410	10,343	32,691	20,501	30
Streets and roads	303	3,041	6,393	7,532	7,505	5,448	30,222	97,637	121,482	1,914
Buildings, public	817	10,132	9,660	4,637	6,258	13,234	41,738	333,624	851,867	4,211
Unclassified, public	1,446	3,406	6,711	1,408	7,327	8,755	29,053	193,370	494,432	2,076
Total public	3,263	17,985	29,399	15,009	23,611	35,975	125,242	690,349	1,543,768	9,143
Federal government (included in above classifications)	2,868	13,538	21,703	6,626	15,667	33,153	93,555	580,913	1,443,407	.....
Private										
Bridges, private	.....	.....	.....	.....	.....	.....	.....	1,325	2,220	.....
Industrial buildings	245	1,353	985	7,235	1,623	645	12,086	83,000	104,376	1,848
Commercial buildings	650	900	1,673	812	500	5,450	9,985	88,541	100,308	700
Unclassified, private	.....	1,870	2,679	548	4,124	1,277	10,493	28,615	15,580	37
Total private	895	4,123	5,337	8,595	6,247	7,372	32,569	201,481	222,484	2,585
Total Engineering Construction:										
June, 1944 — 5 weeks	4,158	22,108	34,736	23,604	29,858	43,347	157,811	.....	.....	11,728
May, 1944 — 4 weeks	3,833	23,896	21,522	14,017	17,729	57,860	138,857	.....	.....	9,082
June, 1943 — 4 weeks	10,750	25,163	62,389	18,296	61,581	95,814	274,493	.....	.....	9,065
Six Months — 1944	25,044	131,512	155,543	111,649	139,125	325,897	.....	891,830	.....	44,672
Six Months — 1943	70,049	218,094	413,715	210,215	398,287	446,292	.....	.....	1,766,252	53,779

CONCRETE HIGHWAY NEWS

Universal Atlas Cement Company (United States Steel Corporation Subsidiary)
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OFFICES: New York, Chicago, Albany, Boston, Philadelphia, Pittsburgh, Minneapolis, Duluth, Cleveland, St. Louis, Kansas City, Des Moines, Birmingham, We

FROM NEW HAMPSHIRE TO MINNESOTA

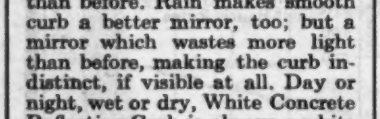
LIGHT REFLECTING CURB MAKES SAFER HIGHWAYS

White Concrete Reflecting Curb made with Atlas White Cement most effective where visibility is lowest

To be clearly visible at night it is not enough that a curb be *white*. It must also reflect the car's own lights *so that the driver can see the road's edge*. That is why White Concrete Reflecting Curb is made of Atlas *White* (not gray) cement, and why the curb's face is saw-toothed to provide angled "mirrors."

The diagrams below show how this curb functions and why it stands out clear and sharp, while a smooth curb is barely visible. Rain turns these reflecting faces into even better mirrors, and on rainy nights White Concrete Reflecting Curb is even *more* visible than before. Rain makes smooth curb a better mirror, too; but a mirror which wastes more light than before, making the curb indistinct, if visible at all. Day or night, wet or dry, White Concrete Reflecting Curb is always a white guide to safety.

For full information on White Concrete Reflecting Curb ask for the book "A White Guide to Safety." Write to our Atlas White Bureau.



A smooth curb (above) wastes light . . . reflects it up and away from the driver. A White Concrete Reflecting Curb (below) conserves light . . . reflects it back to the driver. A smooth curb is barely visible at night; a White Reflecting Curb stands out—bright and clear.

ENR-DC-4

Atlas Duraplastic* air-entraining portland cement solves road scaling on nearly 100 paving installations

Photographs of sections from the Universal Atlas original test road built in 1938 at its Hudson, N. Y., plant, taken after 60 cycles of freezing, thawing and heavy applications of de-icing salt. Note the severe scaling on the normal cement section (left), while the Duraplastic section (right) is 97% scale-free.

ON HIGHWAYS, streets and airports in over a dozen different states concrete pavements made with Atlas Duraplastic are now duplicating the results of this original test road built six years ago. Some of these have passed their fifth winter of freezing, thawing and de-icing applications, and all are practically scale-free, thanks to Atlas Duraplastic.

Atlas Duraplastic was developed after years of research and test by Universal Atlas to combat the scaling of concrete paving under ice-removal treatment. Not only has Duraplastic proved its value in the control of pavement scaling, but experience has demonstrated that Duraplastic makes concrete more workable, more plastic, more cohesive, more uniform and more durable throughout. Segregation and bleeding are minimized, and the concrete dumps, spreads, screeds and finishes more easily. Duraplastic complies with current Federal and ASTM specifications.

When planning your post-war streets and highways, write to our Technical Service Bureau for further information on Atlas Duraplastic. Ask for reprints of technical articles on city and state installations and on the original research.

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • JULY 13, 1944 • VOLUME 133 • NUMBER 2

Engineering educators plan for training after the war

Society for the Promotion of Engineering Education favors more concentration on engineering fundamentals and on civic responsibilities

R. F. Legget
Associate Professor of Civil Engineering
University of Toronto

Engineering education after the war was the major theme of the 52nd annual meeting of the Society for the Promotion of Engineering Education, held in Cincinnati, Ohio, June 22-25. The meeting attracted a near record attendance of about 600, with representatives from engineering schools throughout this country and Canada. In contrast to the Chicago meeting last year, little was heard at Cincinnati about the special Army and Navy training programs, attention being centered on problems to be faced by engineering educators as soon as hostilities cease.

H. S. Rogers, president, Brooklyn Polytechnic Institute, was elected president to succeed R. E. Doherty of Carnegie Institute of Technology; and N. W. Dougherty of the University of Tennessee and H. M. Crothers of South Dakota State College were elected first and second vice presidents, respectively.

The Lamme Medal was awarded to Hardy Cross of Yale University, as reported elsewhere in more detail in this issue.

A shift in emphasis

R. E. Doherty, in his presidential address, strongly urged a shift in emphasis in educational planning from subject matter to intellectual methods. The engineering profession of tomorrow, said President Doherty, will be largely what engineering education makes it today. He suggested that the report of the Committee on Engineering Education After the War, which was published in full in the June issue of the *Journal of Engineering Education*, pointed the way for the immediate advance.

The report referred to by President Doherty was prepared by a committee of 21 engineering educators headed by H. P. Hammond of Pennsylvania State College. That committee endorsed and confirmed the findings of the 1940 committee on aims and scope of engineering curricula, and went on to say that recent events have shown the need for a "more positive indoctrination in civic and professional responsibilities" with a corresponding need for strengthening of secondary education.

An outline of the report was presented later in the meeting by Dean Hammond, Harry S. Rogers and W. E. Wickenden.

Stressing the need for concentration on fundamentals in undergraduate work, with provision in the senior year for some study of the management side of engineering, the report calls for the early restoration of graduate work and its extension in scope. The committee believes that "both industry and the engineering profession would benefit from a clearer understanding of the relative functions of technical institutes and engineering colleges," and suggests the establishment of accrediting agencies for technical institutes similar to those now used for accrediting engineering schools.

The second part of the report deals largely with provisions to be made for training returned veterans. Rehabilitation of faculties with effective teachers

(*Continued on following page*)

Acme photo

English roads improved to take invasion traffic

This photograph was taken long before D-Day, and now that the invasion of France has taken place it is released by the censor.

It shows how large trees were cut down, bridges widened and some of the beauty of such picturesque spots as this in England temporarily impaired as engineers prepared for the huge flow of military traffic rushing to the many ports of embarkation for the invasion.

After the war, however, highways like this will be better adapted to modern traffic.

was stressed as an immediate need, and the development of more valid means than those previously employed for selecting and admitting students was strongly recommended.

No conclusions are given in the report with respect to the present accelerated training program in the engineering schools. The report implies, however, that they should not be continued for a longer period than is necessary to meet war needs. For the transitional period immediately following the war, year round instructional programs are envisaged, and the possibility of having veterans kept in separate classes is noted. Emphasized is the need for providing proper guidance to returned men and the desirability of establishing refresher courses.

Humanistic-social emphasis

Comments on the report centered upon its re-emphasis of the need for a sound "humanistic-social stem" in all engineering curricula. The difficulties which the introduction of such study would cause were plainly stated. One speaker urged that more attention be given to humanistic-social matters in the unassigned time of students, his suggestion being that much could be done in residences and dormitories to inculcate students with the fundamentals of a liberal education.

Details of the integrated four-year program of humanistic-social studies now being followed at Carnegie Institute of Technology were given by G. U. Cleeton. Over 20 percent of the assigned student time is being devoted to the non-technological subjects at that school.

Guidance projects

The better part of one of the general sessions was given over to a report by K. W. Vaughn of the Carnegie Foundation for the Advancement of Learning on the progress so far made with the "Measurement and Guidance Project" being carried forward jointly by the S.P.E.E. and the Engineers Council for Professional Development under the sponsorship of the Carnegie Foundation. The object of the program is to develop tests that will discover the scholastic background of the students being tested and their aims and objectives. It was suggested that these tests, when in final form, might be of great use in the selection and guidance of veterans coming back to study in the engineering schools.

The use of films as a means of visual education was discussed by M. C. Giannini of New York University, consultant to the Visual Aids Divisions of the U. S. Office of Education. Based on experience with films for war training purposes, 34 engineering films are planned and will be ready by the end of the year, the list now being available from the Office of Education, Washington, D. C.

Civil engineering courses

Of special interest to civil engineers was a progress report by S. M. Carpenter of Swarthmore College on work done so far by the S.P.E.E. committee which is cooperating with the Committee on Engineering Education of the American Society of Civil Engineers. The cooperating committees are reviewing existing curricula, 97 having been summarized to date.

In discussion, several speakers endorsed the program, stating that such educational research is a very proper function of the major technical societies if they are to insure the steady advance of their respective branches of the profession.

• • •

Lamme Medal awarded to Hardy Cross of Yale

The Lamme Medal for achievement in engineering education was given to Hardy Cross, professor of civil engineering and chairman of the department of civil engineering at Yale University at the June 22-25 meeting of the Society for the Promotion of Engineering Education at Cincinnati.

The citation was as follows: "To Hardy Cross for his development of revolutionary methods of analysis in structural engineering; for his application of these methods to the rigorous training of civil engineers; for his insistence on the great responsibilities of the individual teacher and his scorn of the superficial in education; for his preeminence in building men who are carrying forward his own high standard of straight, hard thinking in the teaching and practice of engineering."

Hardy Cross was born in Virginia in 1885. At seventeen years of age he received his bachelor of science degree from Hampden-Sydney College. In 1908 he received the degree of bachelor of science in civil engineering from Massachusetts Institute of Technology; and in 1911 the degree of master of civil engineering from Harvard. Following his year at Harvard, he became assistant professor of civil engineering at Brown University, where he taught structural, hydraulic, and sanitary engineering and planning until 1918. He then carried on a general practice in structural engineering for three years but returned to teaching in 1921 as professor of structural engineering at the University of Illinois. He remained there until 1937 when he assumed his present duties at Yale.

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John C. Hoyt retires; authority on water

John C. Hoyt, consulting engineer to the Water Resources Branch of the U. S. Geological Survey, retired on June 30 after 42 years in that branch of federal service.

Born in LaFayette, N. Y., in 1874, Mr. Hoyt graduated from Cornell University in 1897 and spent five years in a variety of engineering work before accepting a position in the computing section of the Water Resources Branch of the U. S. Geological Survey in 1902. In 1907 he was appointed assistant chief hydrographer, and in 1911 was named chief of the surface water division, a position that he held until 1930, when he was named consulting engineer.

John Hoyt brought to the Water Resources Branch of the Geological Survey an enthusiasm and aggressiveness that is responsible for much of its growth and the expansion of its services since the turn of the century. He helped to put the work of the branch on a continuing basis through inauguration of a 50-50 cooperative arrangement with the states for the maintenance of gaging stations. He also got Congress to recognize the federal interest in key gaging stations and persuaded the states that gaging could be done better and at less cost by the staff of the Geological Survey.

No desk administrator, Mr. Hoyt made it his business to maintain personal contact with the men in the field. It was through his encouragement that new methods and new equipment conceived in the regional offices were put to wider test and development for general use.

Mr. Hoyt wrote many government papers on water-supply and stream-gaging problems, and prepared many papers for scientific societies and the technical press.

In professional affairs, he was one of the founders of the Washington Society of Engineers and served the American Society of Civil Engineers as a director and vice president. He led the long fight within that society to get fuller representation for the engineers of the District of Columbia on the society's board of direction.

Hiwassee Dam litigation compromised by TVA

Litigation which has been pending in federal court for eight years between the Southern States Power Co. and the Tennessee Valley Authority over lands condemned for the construction of the Hiwassee dam and reservoir in western North Carolina has just been compromised at Asheville, N. C.

Under the stipulation of settlement TVA will make a total payment of $600,000, in addition to the sum paid previously for the Murphy hydro-electric plant. In the original suit, the sum of $1,800,000 was asked for 12,679 acres of land in Cherokee County, N. C., on which the TVA has erected the Hiwassee Dam and reservoir. The litigation was begun in 1936 and has been through all the federal courts of the Fourth circuit, to the United States Supreme Court and back again.

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Baltimore-Washington parkway rights-of-way

Condemnation proceedings to get land for the construction of a Baltimore-Washington parkway have been instituted in federal court at the direction of Gen. Philip B. Fleming, administrator of the Public Works Administration, Washington, D. C.

According to H. S. Fairbank, deputy commissioner of the Public Roads Administration, the proposed parkway "may become part of an eventual express highway between Washington and Baltimore."

Mr. Fairbank said the proceedings were undertaken to obtain a 400-ft. right-of-way for an 18-mi. parkway between Washington and Fort George G. Meade. He said no date had been set for beginning construction. No decision has been reached on the construction of a general expressway between the capital and Baltimore.

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Road building activity increases in Virginia

Highway construction work in Virginia, under way or provided for, is reported to be greater now than at any time since the war started. The state highway department, working in cooperation with the Public Roads Administration, recently obtained the approval of the War Production Board for the construction in 1944 of two bridges and four highway projects, with a total cost of $2,000,000.

ENR sends A. J. Boase to report on South American concrete practice

Word has been received of the safe arrival in Rio de Janeiro, Brazil, of Arthur J. Boase on an assignment as special editorial representative of *Engineering News-Record* to study and report upon the design and construction practices of South American engineers and architects in the field of reinforced concrete building work. While attached to *News-Record's* staff, Mr. Boase will be on leave of absence from his position as manager of the Structural Bureau of the Portland Cement Association. In addition to Brazil, he will visit Argentina and Uruguay in the course of his travels.

Arthur J. Boase

The first Boase reports are scheduled for publication next fall, although some of his observations and conclusions may appear earlier in short dispatches. In the meantime it is proper to emphasize the special significance of the studies that he is undertaking.

From time to time over the past few years the editors of *Engineering News-Record* have heard many questions asked concerning concrete building work in South America. Is it true that proportionately more concrete buildings are built there than in the United States? More important, are South American design methods in advance of ours, as the pictures of unusual structures that reach the United States would seem to indicate? Could such structures be built here under our existing building codes?

In view of the present activity in planning building-code modernization in the United States, it was concluded that answers to these and similar questions would be of special importance in the postwar period, and the editors decided to assume the responsibility of making them available.

Because the investigational and reportorial job required the talents of a specialist in reinforced design as well as in American building-code matters, the editors were particularly fortunate in persuading Mr. Boase to undertake the assignment. That he is recognized as a leading authority in these fields in the United States is attested to by the fact that he is chairman of both the American Concrete Institute Building Code Committee and the American Society of Civil Engineers Committee on Masonry and Reinforced Concrete, as well as a member of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. He is also author-chairman of the A.C.I. publication, "Reinforced Concrete Design Handbook". Finally, Mr. Boase was in Europe in 1936 and so is fully acquainted with concrete design practices there.

A graduate of the University of Colorado in civil engineering, later receiving his master's degree from the University of Pennsylvania, Mr. Boase has spent his entire professional life in structural design work of one kind or another. During the first eight years after college, he was engaged in designing dams and tunnels in the Rocky Mountain region, principally for the Boston Colorado Power Co. Then for three years, as manager of the Fair Engineering Co., Denver, he worked on the design and construction of reinforced concrete bridges in the state of Colorado.

From this work he went to the staff of the civil engineering department of the University of Pennsylvania, and later was made head of the civil engineering department of Pennsylvania Military College. He left this work to become regional structural engineer for the Portland Cement Association at Philadelphia, and in 1932 became manager of the Structural Bureau of the association.

Important road projects in Pittsburgh approved

Reporting to Pittsburgh City Council, an "intergovernmental technical committee" has fully approved four interrelated highway construction projects in Pittsburgh.

These projects are: Extension of Ohio River Blvd. into the lower North Side; Crosstown Thoroughfare connecting Liberty Bridge with the lower end of Bigelow Blvd.; Duquesne Way improvements on the waterfront boulevards at the Point; and the Penn-Lincoln Parkway east and west.

Members of the intergovernmental technical committee approving the projects are: chairman, E. L. Schmidt, district engineer, Pennsylvania Department of Highways; Willard H. Buente, chief engineer, Department of City Planning; Park H. Martin, director, Allegheny County Planning; Donald M. McNeil, traffic engineer, Pittsburgh Bureau of Traffic Planning; Wallace Richards, executive secretary, Pittsburgh Regional Planning Association; Frank M. Roessing, Pittsburgh Public Works director; and John B. Sweeney, Allegheny County Director Public Works.

The report explained the need and purpose of these projects, as follows: "Extension of the Ohio River Blvd. into the lower North Side has the greatest possibility of early accomplishment. It will serve not only the northwest part of the city, but it will also be the main highway to the Ohio Valley, north of the Ohio River.

"The Crosstown Thoroughfare will provide not only a crosstown highway connecting Bigelow Blvd. with Duquesne Way and Liberty Bridge, but will be another step in the completion of a direct north-south highway through the city and county.

"The later construction of a North Side high level bridge connecting with East St., will provide, in conjunction with the new McKnight Road now being constructed by the county, a complete direct highway from the north across the Liberty Bridge and southward through the tubes to Route 51.

"The Penn-Lincoln Parkway in its eastern part will serve the most populous area of the city and county. The western part will serve the new Moon Township airport, and should be extended to the Ohio state line. Designing this parkway is now in hand.

Men may still seek jobs under WMC referral plan

Though all male labor can now be hired only through the United States Employment Service or such channels as it may designate, individuals—including engineers and construction workers—are still free to find employment by their own efforts, whether or not they are already employed. These men according to the USES, must clear their new jobs through its local offices.

If the USES has a call for persons in their particular field, they may be told that men of their experience are badly needed elsewhere. But in line with the voluntary feature of the new setup, applicants have freedom of choice. Employers, also, are free to accept or reject referrals by the USES.

The purpose is to put men to work at jobs for which they are best adapted, and it is believed that the plan will serve this purpose. In order that this may be true on a nationwide basis, the National Priority Committee was recently established in Washington to determine priority needs of the various industries in various sections of the country.

Drucker-Hilbert photo

Chinese engineers in U. S. study postwar industrialization of their homeland

Early this month the American section of the Chinese Institute of Engineers held its annual meeting in New York City. Most of the twelve local chapters in the United States were represented, registration totaling 223.

Following a general session, those present divided into groups to hear papers pertaining to their particular field. The last afternoon was devoted to a general technical forum during which major problems dealing with postwar industrial and engineering problems in China were discussed by leading Chinese engineers now in this country. The meeting ended with a banquet at which both United States engineers and Chinese leaders spoke. The meeting was attended by numerous Americans and was nearly triple in size that of last year's dinner meeting.

A business report during the meeting revealed that within two years membership in the American section of the institute has increased from a few score to about 600 members. This large membership growth is due to the many Chinese engineers sent to this country in the past few years on government missions and to receive further practical training, the number in the United States now totaling about one thousand.

Of interest to American engineers is the fact that the institute publishes a journal featuring regularly a forum of the problems to be met in the postwar industrialization of China, and that 100 copies of this publication are printed on thin paper and airmailed to China.

Construction Communiques

Engineering news from the battlefronts

Philadelphia, Pa.—A U. S. Army Engineer port-repair ship, designed to assist in clearing damaged ports and harbors, was rechristened July 1 at the Philadelphia Engineer district dock, Fort Mifflin. It was named "The Glenn Gerald Griswold", in honor of Captain Glenn Gerald Griswold, Corps of Engineers officer, who died heroically in the performance of duty at Naples, Italy, on December 26, 1943, for which he was awarded the Soldier's Medal, posthumously.

The "Glenn Gerald Griswold" is the former U. S. Navy cargo carrier, "Media." The "Griswold" carries complete shops, equipped with independent, portable generators, and an acetylene lighting system which may be utilized to supplement port lighting systems damaged in military action. As part of its salvage equipment, it carries a complete ponton system, having a lifting capacity of fifty tons, which may also be assembled as a barge.

Other features of this unique ship include a cat-head on the bow, capable of lifting forty tons; booms from 10-ton to 50-ton capacity; special diving gear for underwater cutting and welding; high explosives for demolition of objects which cannot be moved, extensive fire-fighting equipment and a completely equipped hospital section, in addition to a power-driven work boat, power-driven whale boats, oar-propelled life boats and sufficient flotation rafts for the entire crew. The crew are all from the U. S. Army Corps of Engineers, armed, and trained in combat. They were trained under the supervision of the Marine Division of the Philadelphia Engineer District, under the direction of Colonel Clarence Renshaw, commanding officer of the installation.

Guadalcanal—Marine First Lt. Milford A. Matthews, formerly a chemist in the sanitary department of the municipal water works at Houston, Tex., is now serving as head of the waterworks on Guadalcanal, which furnish water for the Marines and other American forces. The plant is called "the South Guadalcanal Municipal Waterworks"; and consist of a 237-ft. well, two 4-in. pumps, 8000 ft. of pipe mains, a 28-ft. tower, and a 10,000-gal. tank. The plant supplies 370,000 gal. of water a day.

Burma—American engineers recently built in a single night an airfield in Burma capable of handling 100 transport planes, according to a letter from Brigadier General Stuart C. Godfrey, chief of air engineers in the China-Burma-India theater.

The letter to Victor Morris of Milwaukee, Wis., who served under General Godfrey as a major in France in World War I, called the feat "a unique achievement which brought me a radiogram from Colonel Philip Cochran saying that my engineers were superb."

General Godfrey said the Chinese, working only with hand tools, and rock from rivers, have accomplished wonders in building airdromes. He told of seeing as many as 90,000 Chinese laborers on one airfield, "swarming like ants, effectively organized and cheerful."

Treasury Islands—Under command of Lt. Charles E. Turnbull (CEC) USNR, Aurelio Tassone, and eight other Seabees landed on one of the Treasury islands to make roads. A Jap pillbox, about 100 feet from the beach, was doing a lot of damage. A major ordered Lt. Turnbull to run a 'dozer through it.

Tassone shielded himself with the blade of the 24-ton cat and, protected by Lt. Turnbull who ran behind him with carbine in hand, charged the pillbox from the rear.

Despite bursts of fire that nearly got him, Tassone plowed ahead and, when directly upon the pillbox, lowered his blade and gave 'er the gun. Crunching of heavy timber and screams of trapped Japs told Tassone his job was done.

Awarded a Silver Star medal, the 29-year-old Seabee gives credit to Lt. Turnbull whom he calls the most courageous man he's every known.

Mediterranean Theater—The 120th Seabee Battalion has returned to the United States after twenty months in the Mediterranean theater, where it wrote a brilliant record of achievement and heroism, the Navy Department has announced.

They went overseas in November, 1942, and constructed, operated and maintained many of the bases from which American planes, ships and men sprung upon Hitler's Europe.

The Navy Department said the battalion "earned the plaudits of everyone, and surprised even the most optimistic with the speed and skill of their construction, and their ingenuity."

Many commendations and citations for outstanding heroism were received by a number of individual members of the 120th.

Detachments of the 120th worked at a dozen different locations along the shores of the Atlantic Ocean and the Tyrrhenian and Mediterranean Seas. Their talents were dispersed over such a wide area that at one time approximately 2,000 air miles separated two of the units.

British Combine photo

U. S. Engineers build airstrip in Normandy

U. S. Army aviation engineers, working within range of German artillery, lock together lengths of steel matting as they build a landing strip at an Allied airfield in northern France. The field was first cleared and leveled by American bulldozers and scrapers ferried across from England, together with thousands of rolls of steel matting.

An account of how these aviation engineers are trained is to appear in ENR July 27.

JOBS OF THE WEEK

AMMUNITION OVERHAUL FACILITIES, Seal Beach, Calif.

William P. Neil Co., Ltd., Los Angeles, Calif., has been awarded a contract by the Bureau of Yards & Docks, Navy Department, Washington, D. C., for ammunition overhaul facilities, at Naval Ammunition Depot at $1,229,424.

AIRPORT RUNWAYS, Waterloo, Ia.

Civil Aeronautics Administration, Kansas City, Mo., received bids for surfacing airport runways. Concrete Materials Construction Co., Cedar Rapids, Ia. was low on asphalt surfacing at $1,188,020; Central Engineering Co., Davenport, was low on concrete surfacing alternate, $1,387,003. R. E. Herner, Kansas City, is the construction engineer.

TAXIWAYS, Boeing Field, Seattle, Wash.

U. S. Engineers, Seattle, awarded a contract for additional parking apron, taxiways, installing flood lighting, to N. Fiorito Co., Seattle, Wash., at $1,644,658.

AIRFIELD IMPROVEMENTS, Fort Crook, Neb.

U. S. Engineers, Omaha, Neb., awarded a contract for airfield improvements, strengthening runways, shoulders, and paving to Peter Kiewit & Sons Co., Omaha, Neb., at $1,324,141.

RAILROAD, Washington

Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a contract for railroad (2nd increment) ammunition storage and transshipment facilities, Puget Sound Navy Yard, to Sound-Kiewit, Seattle, Wash., at $2,156,217.

DWELLINGS, Mayfair, Calif.

Hathaway Homes, Inc., Mayfair, contract for constructing 196 dwellings awarded to J. M. Walker Construction Co., Mayfair. The estimated cost is $1,000,000.

DWELLINGS, Windsor, Ont.

Sterling Construction Co., Ltd., Windsor, will construct by own forces 500 dwellings at an estimated cost of $2,750,000.

AIRPORT RUNWAYS, Langley Field, Va.

T. E. Ritter Co., Norfolk, Va., was the lowest bidder for runways, taxiways and parking apron when U. S. Engineers, Norfolk, received bids at $1,941,563.

AIRPORT, Decatur, Ill.

M. J. Boyle & Co., Chicago, Ill., was the lowest bidder at $1,307,299 on three concrete runways, underdrains, storm sewers, fence, etc. at airport when Civil Aeronautics Administration, Chicago, Ill., opened bids.

CHEMICAL PLANT, Louisville, Ky.

B. F. Goodrich Co., Akron, O., awarded a contract for design and construction of chemical plant to manufacture resins to Austin Co., Cleveland, O. The estimated cost is $1,200,000.

LANDING FIELD FACILITIES, Muroc, Calif.

U. S. Engineers, Los Angeles, Calif., awarded a contract for additional landing field facilities, reinforced concrete runways, to Peter Kiewit & Sons Co., Los Angeles, Calif. at $6,634,167.

HOUSING, Detroit, Mich.

W. E. Wood Co., Detroit, Mich. was the lowest bidder for 399 temporary family dwelling units when Public Housing Authority, Cleveland, O., opened bids at $1,540,000. O. Winn and P. Brezner, Detroit, are the architects.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 191.

Big postwar highway program for Ontario

Ontario will spend $192,000,000 on highway construction in the first four postwar years, according to a statement of Highway Minister George H. Doucett. The money will be spent on widening and improving existing roads in addition to the construction of entirely new highways.

The latter will include the extension of the Queen Elizabeth Way from Burlington to Windsor, thus giving two superhighway routes to the United States. The same highway will be continued eastward to the Quebec border. A new road will be built from Toronto to Barrie, 60 mi. north, to relieve traffic pressure on Yonge St., Toronto's main artery to the north. Twenty survey parties are working in various parts of the province in preparation for this large highway construction program.

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Cloyd M. Chapman dies; materials testing expert

Cloyd M. Chapman, consulting engineer, New York City, and widely known as a materials and testing specialists, particularly in the field of concrete, died July 2 at the age of 70. Mr. Chapman was president of the American Society for Testing Materials in 1932, and was active in its councils from 1908 on. He served for over 25 years on both the cement and the concrete committees, being chairman of the latter from 1926 to 1932. He was also on committees concerned with iron and steel corrosion, paint, lime and laboratory equipment.

Mr. Chapman graduated from Cornell University in the class of 1898 in mechanical engineering. During the Spanish American War he served as an engineer officer in the Navy, and at its close entered the employ of Thomas A. Edison as an assistant in his private laboratory. Subsequently he did mining exploration work for Mr. Edison in Mexico, Canada and Australia. From 1905-1920 Mr. Chapman was employed by Westinghouse, Church, Kerr & Co. on design and construction work and as engineer of tests.

During the first World War Mr. Chapman had charge of the design and construction of Rock Island Arsenal for the War Department. From 1920 on he was in private consulting practice.

MEETINGS

NORTH CAROLINA LEAGUE OF MUNICIPALITIES, annual meeting, Robert E. Lee Hotel, Winston-Salem, N. C., Aug. 23-25.

PENNSYLVANIA WATER WORK OPERATORS' ASSOCIATION, eastern Pennsylvania section, Columbia, Pa., August 28-29.

The annual convention of the American Society of Civil Engineers, scheduled for July 19-21 at Cleveland, Ohio, has been cancelled.

The North Carolina Society of Engineers has cancelled its annual convention, scheduled for Aug. 4-6, in order to cooperate with the government's request to eliminate travel not directly concerned with the war effort.

OBITUARY

John B. Hittell, 78, prominent Chicago engineer and an employee of that city for nearly 50 years, died there July 4. He was employed in the engineering department of the board of local improvements for 40 years and served as its chief engineer of streets until being retired 3 years ago when the board's engineering department was disbanded. Following his retirement, Mr. Hittell entered into the partnership of Grimes-Hittell, consulting engineers, Chicago. He graduated in civil engineering from Lehigh University in 1887 and was one of the founders of the American Road Builders Association. He was past president of the Illinois Society of Engineers.

George S. Crego, 49, widely known in construction engineering circles in Cleveland, Ohio, died July 5. A native of Buffalo, N. Y., Mr. Crego was a civil engineering student at Case School of Applied Science when World War I interrupted his studies. He served in France more than a year with the 324th Field Artillery. He re-enrolled at Case after the armistice, and was graduated in 1919. For many years he was civil engineer for several Cleveland firms. Eight years ago he joined the H. B. Fuller Construction Equipment Co. He was president at the time of his death.

Frank R. Frost, 61, president, Superior Steel Corp., Carnegie, Pa., died June 29. Frost was graduated from Allegheny College in 1905. He became principal assistant engineer in construction of the Hales Bar Dam at Guild, Tenn., and joined Superior Steel in 1917.

Oliver J. Schieber, 55, civil engineer with the Southern California Edison Co. for 30 years and a division superintendent of the Metropolitan Water District for seven years, died June 23 in Los Angeles, Calif.

Gustav H. Leopold, 80, designer of important buildings in Milwaukee, Wis., Minneapolis, Minn., Superior, Wis., Baltimore, Md., Philadelphia, Pa., and other cities, died in Milwaukee June 23. He was former architect and associate chief engineer for the Wisconsin Central railroad.

William H. George, 72, died June 26. He was a former president of the San Francisco Builders' Exchange and general manager of the Cowell Cement Co. in Contra Costa County.

Kentucky highway work to cost $2,500,000

Approval of approximately $2,500,000 in improvements of Kentucky roads to remedy serious traffic conditions has been given by the War Production Board, State Highway Commissioner J. Stephen Watkins announced June 29.

The commissioner said the program includes the proposed new $522,000 bridge at Carrollton and two small bridges on U. S. 25-E. The remainder of the program consists of improving highways to eliminate gaps between hard-surfaced roads.

Commissioner Watkins said bids would be advertised for soon on many of the projects and that work on some of them should be finished this year.

CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction in continental U. S. totals of $157,811,000 for June, an average of $31,562,000 for each of the five weeks. This weekly average volume, not including the construction by military engineers abroad, American contracts outside the country, and shipbuilding, is 9 percent lower than the average for the four weeks of May, 1944, and 54 percent below the average for four weeks of June, 1943.

Public construction, on the weekly average basis, is 4 percent higher than in the preceding month, but is 50 percent lower than in the 1943 month. State and municipal work tops last month by 4 percent and is 15 percent higher than last year. Federal volume gains 5 percent compared with a month ago, but is 58 percent under a year ago.

Private construction is 39 and 64 percent lower, respectively, than in May, 1943, and June, 1944.

The June total brings construction volume to $891,830,000 for the opening six months of 1944, a figure 51 percent lower than a year ago, and the lowest first-half volume reported since 1935. Private construction is 13 percent below the 1943 period, and public construction declines 57 percent.

WEEKLY CONSTRUCTION SUMMARY

CONTRACTS

Continental U. S. Only
(Thousands of Dollars)

	Week Ending July 15 1943	July 6 1944	July 13 1944
Federal	$85,425	$13,855	$44,531
State & Municipal	5,106	3,266	8,966
Total public	$90,531	$17,121	$53,497
Total private	13,484	1,801	9,013
TOTAL	$104,015	$18,922	$62,510
Cumulative 1944 (28 weeks)			$973,262
1943 (28 weeks)			$1,972,417

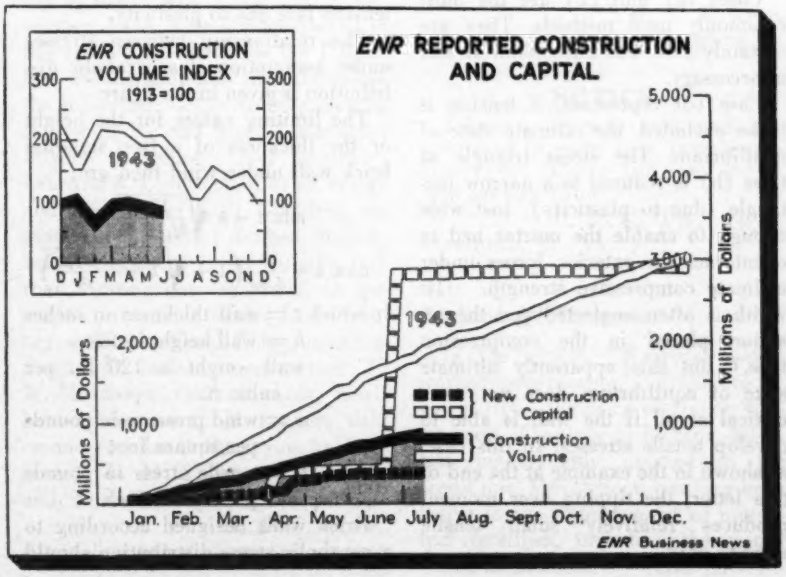
Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	1943 28 Weeks	Cumulative 1944 28 Weeks
NON-FEDERAL	$264,177	$202,031
Corp. Securities	15,321	85,345
State & Mun.	88,723	60,556
RFC Loans	9,000	56,130
FPHA Loans	3,133	....
REA Loans	20,000	....
Fed.-Aid Hwy	128,000	....
FEDERAL	$2,653,838	$245,266
TOTAL CAPITAL	$2,918,015	$447,297

ENR INDEX NUMBERS

Index base=100		1913	1926
Construction Cost	July '44	299.94	144.18
Building Cost	July '44	235.55	127.33
Volume	June '44	91.	40.



Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Wind Pressure on Walls

Sir: H. A. Sweet in his article in *ENR*, Oct. 21, 1943, p. 630, reports an interesting investigation of the "Resistance of Brick Walls to Wind" and draws attention to the inadequacies of the building codes in this respect. The writer worked on the same problem some time ago and made certain assumptions which differ from Mr. Sweet's assumptions. In addition he found that the tests made so far are insufficient to permit a satisfactory solution of the problem.

The main points which need a clarification are:

1. On what ultimate state of equilibrium has the statical investigation to be based—deformation, tipping over, or rupture?

2. What are the allowable stresses for the mortar bed—compression, tension or bond?

There are several ways to design a brick wall to resist lateral forces: (a) To keep the resultant of all forces in the interior third (kern) of the wall; (b) to design the wall still under exclusion of tension, but to permit a stress triangle at the compression face; (c) for tipping over; (d) under consideration of tensile stresses (rupture).

Cases (a) and (b) are the most commonly used methods. They are certainly safe, but uneconomical and unnecessary.

Case (c) represents, if tension is to be excluded, the ultimate state of equilibrium. The stress triangle of Case (b) is reduced to a narrow rectangle (due to plasticity), just wide enough to enable the mortar bed to counteract the exterior forces under ultimate compressive strength. (Its width is often neglected and the reaction placed in the compression face.) But this apparently ultimate state of equilibrium does not seem critical at all if the wall is able to develop tensile stresses. In this case, as shown in the example at the end of this letter, the tipping over moment produces relatively small tensile stresses only.

Furthermore the use of a safety factor will reduce the stresses so that the ones really encountered are of a moderate degree. In order to bring the existing state of equilibrium into a certain proportion to the state of failure it is desirable to have the stress distributions for both conditions at least similar if not proportional. The writer is therefore of the opinion that a brick wall to resist lateral forces should be designed according to Case (d), with rupture as condition of failure.

Mr. Sweet investigated the height limitations of a brick wall with reference to rupture resistance, but he assumed a straight-line stress distribution which does not seem acceptable, at least at the instant before failure when the tension part is already in a state of plasticity.

For brittle materials the moduli of elasticity for compression and tension are not equal and their influence on the stress distribution has to be taken into account. Only for small lateral forces producing stresses within the elastic limits the stress distribution will follow Hooke's law. With increasing moment it will take a more and more curved course and an instant before rupture will assume a parabolic shape with a horizontal tangent at the tension face due to plasticity.

The relationship between stresses under assumption of a parabolic distribution is given in the figure.

The limiting values for the height or the thickness of a free standing brick wall under wind then are:

$$\text{min. } t = h\sqrt{\frac{12w}{6f_t + 5h}}$$

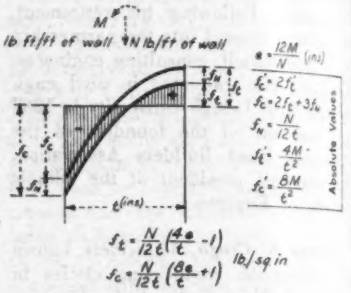
$$\text{max. } h = \frac{t^2}{4.8w}\left(1 + \sqrt{1 + \frac{11.5\,f_t w}{t^2}}\right)$$

In which t = wall thickness in inches
h = wall height in feet
wall weight is 120 lb. per cubic ft.
w = wind pressure in pounds per square foot
f_t = tensile stress in pounds per square inch

Brick walls designed according to a parabolic stress distribution should come closest to the real condition and give the most favorable results.

If rupture is recognized as governing for the failure, knowledge of the maximum allowable stresses in the mortar bed is indispensable.

The existing tests on bending and rupture of brick walls are too few and not satisfactory. To my knowledge, there were no tests made which gave direct data on the tensile strength and the bond of cement mortar beds



measured directly at the location of the rupture. There are no tests either which determined the stress distribution at the critical section.

Moduli of rupture figured from the critical moment and the section modulus of the wall seem to me of fictitious value only.

The following figures show the tensile stress in a wall with parabolic stress distribution for the tipping over moment. For $e = 12M/N = t/2$ . . . $M = Nt/24$, $f_t = f_N = N/12t$. For a wall weight of 120 lb. per cu. ft. . . . $N = 10th$, $M = 5ht^2/12 = wh^2/2$, $h = 5t^2/6w$ for $w = 20$ lb. per sq ft., $h = t^2/24$, $f_t = 5t^2/144 \cong t^2/29$. The maximum height of a 16½-in. wall figured for tipping over at 20 lb. per sq. ft. wind is then $16.5^2/24 = 11.3$ ft. This wall will develop, if figured under consideration of tensile stresses with parabolic distribution, a tensile stress f_t of only $16.5^2/29 = 9.5$ lb. per sq. in.

F. KRAMRISCH,
Structural Engineer, Albert Kahn, Associated Architects & Engineers, Detroit, Mich.

Influence Line Computations

Sir: In his letter published in the issue of March 23, 1944, p. 398, M. W. Rosenstein states that the computation of a complete set of influence lines for moment in a continuous beam by the method presented in my article (*ENR*

Dec. 16, 1943, p. 911) would involve "as much work, if not more, than by simply placing a unit load at each of the points and computing the moments directly." It may be that Mr. Rosenstein was thinking only of the preliminary computations. After computing the moments for each position of the unit load, it is still necessary to determine moments at all the intermediate points, and retabulate before the influence lines can be plotted. Using the semi-graphical method, the results are obtained more directly.

If influence lines for moment only at a large number of points are required, it is true that no time can be saved by using the semi-graphical method. In the investigation of an existing continuous girder for unusual concentrated loadings, however, influence lines are needed at only a few critical points. There is no question then but that the semi-graphical method has a definite advantage. Neither is there any question as to its superiority in the computation of influence lines for shear or reaction, whether for just a few points or for many.

The writer wishes to thank Mr. Rosenstein for calling attention to the need for stating the scope of application of the method more precisely, for illustrating the abbreviate moment distribution procedures, and for suggesting the use of the column analogy with equivalent elastic properties of adjoining spans in determining the "indeterminate moments."

C. J. POSEY,
Iowa City, Iowa

Concrete Placing Records

SIR: Reference is made to the news item, "Concrete Placing Record Claimed by Fontana Dam," *ENR*, June 8, 1944, p. 850.

You state: "What is believed to be a world's record for the placement of concrete from a single plant was made at Fontana Dam by placing 241,211 cu. yd. during the month of May, 1944." For your information, the Consolidated Builders, Inc., Mason City, Washington, general contractors for the completion of the Grand Coulee Dam, hold all world concrete placing records in existence.

In October, 1939, a total of 530,475 cu. yd. of concrete was placed. During twelve different months in 1938, 1939, and 1940 concrete placing exceeded 241,211 cu. yd. Further, on May 25, 1939, during a twenty-four hour period, 20,684, cu. yd. of concrete was placed.

DAVID A. OPPENHEIM,
Production Engineer, Kaiser Cargo, Inc. Richmond, Calif.

(Editors Note — Two concrete plants were operated at Grand Coulee damsite, each with four 4-cu. yd. mixers. At the time the record was made both plants were under one roof, *ENR*, June 8, 1939, p. 749.)

Rio Doce Valley Personnel

SIR: The article "Way Down the Rio Doce Valley" (*ENR* Dec. 30, 1943, vol. p. 954) inadvertently contained an inaccurate statement.

Reference is made to the paragraphs on page 62 on the subject of railroad spiral tables in the metric system. The article should have stated that Eugene J. Shaw, the present chief engineer for Parsons, Brinckerhoff, Hogan & Macdonald, prepared field table for the metric spiral when work was initiated in Brazil. Mr. Shaw was at the time of the editor's visit, and still is, chief engineer for P.B.H.&M. on the Vale do Rio Doce project. In addition to his general duties as chief engineer on the project he is directly responsible for all railroad location. The writer's contribution to the spiral text was to provide information on the principles and use of the railroad spiral which until his writing was not available in the metric system in Brazil.

Many of the staff engineers serving in Brazil with P.B.H.&M. in December, 1943, were not mentioned in the article. On that date the P.B.H.&M. organization and staff comprised the following: G. A. Amberg, special representative and general manager; Eugene J. Shaw, chief engineer; Leonard A. Lovell, chief of all design and office work; R. D. Gladding, engineer at the mine; Reuben Boblow, bridge engineer; L. M. Hooper, railroad locating engineer; and, as specialists in various fields: R. C. Gautier, architect; Frank Foley, construction; I. R. Mulvey, construction; C. W. Murdaugh, railroad yards; Lewis Levine, design; C. D. Leggett, field engineer; John C. Burgoyne, field engineer; F. M. Townsend, railroad; and, Russell H. Yerkes, accounting.

R. D. GLADDING,
Parson, Brincherhoff, Hogan & MacDonald, President Vargas, Mines Gerais, Brazil

Correction—Canol Article

In the article "Controversial Canol" (*ENR* May 18, 1944, vol. p. 730), the statement with respect to operation of the project is in error. The article states, "Operation of the refinery and the distribution of gasoline will be under the direction of the British American Oil Co., which is a subsidiary of the Standard Oil Co. of California."

According to a letter from the British American Oil Co. Ltd., Toronto, Canada, "The above is a misstatement of fact in two respects—firstly in that the British American Oil Co. Ltd. has no connection whatsoever with the Canol project, and secondly, and of more importance, that the British American Oil Co. Ltd. is not a subsidiary of the Standard Oil Co. of California, nor of any other company. The British American Oil Co. Ltd. is a wholly independent Canadian corporation, operating from coast to coast. It is the largest independent oil company operating in the Dominion of Canada."

The article should have stated that the Standard Oil Co. of Alaska, a subsidiary of the Standard Oil Co. of California, will operate the Whitehorse refinery and the gasoline pipeline.

• • •

How to Get Business

Sir: The inclosed clipping from *The Pocahontas Times* should give professional engineers a new idea in the conduct of their business.

M. C. HOWARD,
Harrisburg, Va.

NOTICE

I have a compass now and am prepared to serve my people as a Surveyor. Come for me and I will go any time.

B. F. E. Wooddell,
Dunmore, W. Va.

• • •

Jackson Waterworks

In the article, "Wartime Waterworks Modernization" (*ENR*, June 1, vol. p. 816), the name of Mayor Walter Scott of the city of Jackson, Miss., was inadvertently omitted in the credit line. Mayor Scott has long been active in the improvement of municipal facilities, including the waterworks at Jackson. —THE EDITORS.

EDITORIALS

VOLUME 133 NUMBER 2

July 13, 1944

Less Federal Aid

THE DECISION of the Roads Committee of the House of Representatives to cut in half the amount of federal aid to be provided for highway construction in the three years following the war appears to have a significance beyond the highway field. Those communities that are looking to the federal government for aid in housing or for public works other than highways may well mark what this Congressional committee has done to the postwar highway bill. Its action indicates clearly that Congress is beginning to recognize that the federal debt is expanding at an unprecedented rate while the debts of states and municipalities are remaining stationary or are even being reduced. Future commitments are being studied in the light of that fact. This change in Congressional approach to federal expenditures lays a new burden on those who aim to have a large program of public work ready for contract when the war ends. They must convince their local communities that federal aid will not be forthcoming in large amounts, hence much if not all of the financing of postwar public works must be arranged locally if the work is to be ready when it is needed.

Erosion at Grand Coulee

IT CAN BE SAFELY PREDICTED that there will be skeptics who will base gloomy predictions on the conditions found in the bucket of the spillway of Grand Coulee Dam, reported by Kenneth B. Keener in this issue. Such erosion as was discovered at scattered points after less than seven years of service may appear to some as evidence of defective design and as indicative of possible injury to the structure itself. Actually, the results should be accepted as convincing evidence that engineers can design structures to handle safely the unprecedented forces that are released when vast quantities of water are dropped through great heights. No one familiar with the forces to be handled at Grand Coulee expected that there would be no injury to the spillway bucket. The significant fact about the finding is that so little damage was done by the debris that accumulated in the bucket when subjected to the irregular flow that was discharged during the construction period. Moreover, such adverse conditions will not have to be met again. Also worthy of note is the fact that the design finally adopted for the spillway of Grand Coulee Dam was not as costly as would have been a design similar to that used at several other dams where large volumes of water are being handled satisfactorily. Thus, from the standpoint of both engineering and economics, the Grand Coulee spillway should be rated a success.

Up-to-date Highway Design

STANDARD SPECIFICATIONS for highway construction are revised frequently to comply with changing requirements for such work. But less often are policies of design examined with a view toward their simplification and uniformity of procedure. Prewar standards will not suffice, and only the most up-to-date design policies should be acceptable for launching the huge roadbuilding program now in the planning stage. How one state highway department, Arkansas, took advantage of the wartime lull in roadbuilding to review and revise its design policies for highway construction is outlined elsewhere in these pages. Other highway departments, if they have not already done so, can make a real contribution to the field of improved highway construction by weeding out the outmoded practices in their design procedures. Shortage of manpower is no excuse for postponing this important study since it is the responsibility of departmental heads and experienced designers currently engaged in road planning. A little time spent now in the conscientious review of design methods looking toward the adoption of up-to-date standard policies and the formulation of simplified design practices will pay big dividends.

Coral in the Pacific

AMONG THE MANY SUCCESSFUL ELEMENTS of our Pacific war operations the use of coral by our military construction forces for airfield and road surfacing is particularly notable. What they have done and what they have learned while doing it add a bright and instructive chapter to construction history.

Coral, of course, has been used as a road surfacing material in Florida for a long time. Fills were made with coral in the Hawaiian Islands before the end of the last century, and Pan-American Airways used coral extensively in the series of air-

bases it built as stepping stones across the Pacific before the war. The idea of using the rocklike calcareous material made up of the skeletons of marine animals for construction purposes, therefore, is not new. What give the Pacific coral operations distinction are the size and extent they have achieved since Pearl Harbor, overshadowing all previous coral construction.

The Army Engineers first built a series of airfields extending from Hawaii to Australia, on most of which coral was the surfacing material. Unfortunately those early stages of wartime construction were shrouded in secrecy and little is known of Army experience with coral. As time went on, however, and our operations moved westward, the Navy's Seabees began to build with coral and, despite the rush and emergency nature of their job, they managed to develop techniques and accumulate knowledge respecting the material that have widespread value.

Something of what the Navy has learned about coral in the Pacific is told for the first time in two articles in this issue. The first records what N. A. Bowers, of *News-Record's* staff, observed of coral construction methods and design practices in a three-month tour of the islands as a Navy war correspondent. The second is a scientific discussion of coral as a construction material by Harold T. Stearns of the U. S. Geological Survey, based not only on a recent analysis of different types of coral deposits made for the Navy, but upon 14 years of first hand study of Pacific island formations. The articles were prepared at the same time, and written to complement one another. Taken together, they provide the first real facts about the use of coral in the Pacific, and summarize much of the progress made to date.

Still further progress is, of course, desirable, notably in the development of simple field tests to aid in quick classification and rating of corals, particularly as to their cementing qualities. Such attention to details was not possible under the pressure of construction near the front line, but now that so substantial a start has been made and the front has moved west, coral techniques should have more careful and deliberate study as a branch of soil mechanics. Meanwhile, the record of successful emergency construction proves that excellent runway surfaces can be made with this not-too-well-known material.

Conventions as Usual?

"IT WAS A HARD WAR over here, wasn't it!" That statement was made by a soldier in one of the engineer regiments of the last war, returning after two years of hard work in France, as he viewed the neat paths, flower beds, grass plots and freshly painted barracks in one of the base camps in this country. The filth, hardship and fatigue of war seemed far away indeed.

Today, other young men in a vastly greater number and for much longer periods of time are meeting and enduring hardships more trying to their spirits than the hardships met by the man who 25 years ago made the remark quoted above. Now, also, these young men are beginning to come home, some on furlough, some in hospital ships or planes. They are finding our transportation lines overloaded. By whom? In part by people going to conventions; engineers, morticians, stamp collectors, shoe merchants, and a host of others who are not letting the war interfere with their normal routine of holding meetings.

Against such a background the action taken a week ago by the American Society of Civil Engineers in canceling its annual convention is one deserving of commendation. The Society's executive committee accepted as sincere the request of the Director of Defense Transportation that no meetings be held between now and the end of the year that are not directly connected with the war effort. And they reached the only conclusion that could be reached by men willing to face facts, namely, the society was not contributing to the war effort by going ahead with the Cleveland meeting.

Will other organizations do likewise? If they don't, and the great majority of conventions scheduled to be held within the next few months, are held, then the action taken by the A.S.C.E. and a few other organizations can have little effect in improving the transportation situation. In that event the ODT may yet find it necessary to resort to rationing railroad accommodations.

Regardless of what happens, however, those who have the courage to cancel meetings, even at the expense of setting back the normal work of their organizations, must know that they can face the returning service men with a clear conscience. They will have done their part in reducing the transportation load.

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ENGINEERING ABROAD AS SEEN BY ENR EDITORS

Coral Airstrips on Pacific Islands

N. A. Bowers
Pacific Coast Editor, Engineering News-Record

***Contents in Brief**—Rush construction of airfields, a major factor of warfare in the Pacific, was greatly facilitated by developing means of making good runway surfaces with coral. Methods of handling coral, desirable conditions for working with it and results accomplished are covered in this article. Part II of the article, by Harold T. Stearns, Geologist in charge of Pacific investigations, Geological Survey, U. S. Department Interior, deals with types of corals, their distinguishing traits and qualities.*

"How soon can you build, on Island X, an airstrip on which we can land bombers?" This has become a stock question for Seabees in the Pacific theaters of war. Sometimes Island X can be visited for a hasty reconnaissance; more often maps made from aerial photographs are the only source of advance information, although in some instances adventurous Seabee officers, with native guides, have slipped into Jap-held territory to quietly make surveys and estimates on the "promised land" that combat troops were soon to take.

Whichever method of advance planning is used, the construction program is the same—get bulldozers ashore first and start them on clearing and grading immediately while other workers are setting up any necessary defenses, building camp, providing water supply and generally "digging in".

Fundamentals of Location

Factors to be considered in selecting sites for these island airstrips include available space where approaches permit of a low gliding angle (40 to 1 if possible) drainage and foundation conditions, amount of necessary grading for a finished gradient of less than 1½ percent and availability of material suitable for making a hard surface. There are other considerations, of course, such as jungle cover to be removed, adjacent space for dispersal areas and many more. But rarely can any great number of these conditions be found to be favorably, and if there is even barely enough space at a site when

Equipment of various types speedily takes coral from deposits found under dense forest cover in New Guinea.

airstrip is badly needed, the boys likely to be sent in with orders to the best they can with whatever ditions they find. Unfortunately, "flat, open areas" sometimes cted as sites on hasty airplane sur-s, turn out to be swampy ground. s an "open area" because it is too to support trees. Then the con-ction problems become acute in-ed.

Self-sufficient units

Altogether the complexity of prob-ns on such an assignment is ough to furrow the brow of the st experienced construction engi-er. But a Seabee battalion has out 1,000 skilled, resourceful men o have trained under capable of-ers of the Navy's Civil Engineer rps and they come ashore bringing odern equipment which they are ustomed to handling. Their out-s are entirely self-sufficient, each n has a job to do and little time is t after they land. Bulldozers push er small or poorly rooted trees, ch as cocoanuts, the larger trees e dynamited and the fallen forest, gether with the humus that lies der it is soon being shoved hastily one side or the other.

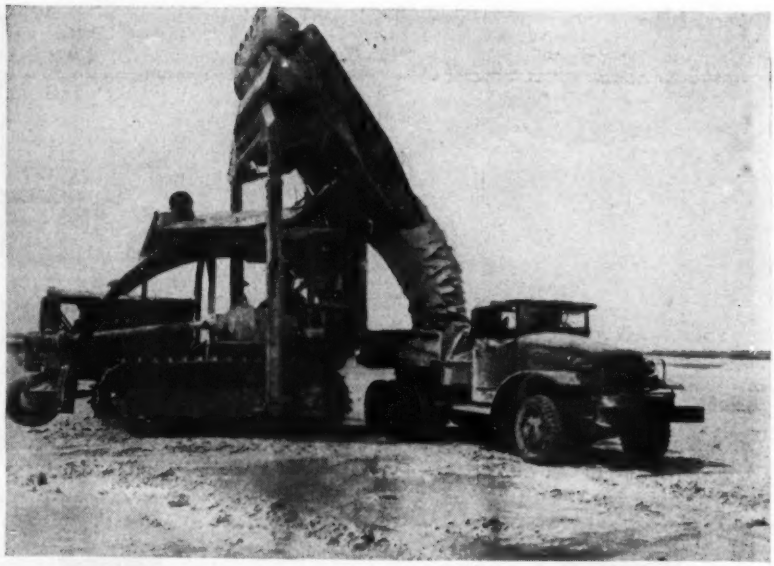
In this work the carrying scrapers, ways called "pans" down in the Pa-fic, play an important part in work-g with the tractors. If it takes six lldozers to shove aside the dyna-ited remains of a large mahogany unk, they use six. Working three ifts, with ample reserves and en-siastic team work, the most for-dding tasks do get done. The 10 to -cu.yd. pans and D8s or HD-14s, ich are now standard equipment, reduce the heaviest jungle to a earing within a few days, and rape away the overburden right wn to the hard surface, which is ually not deep in these islands.

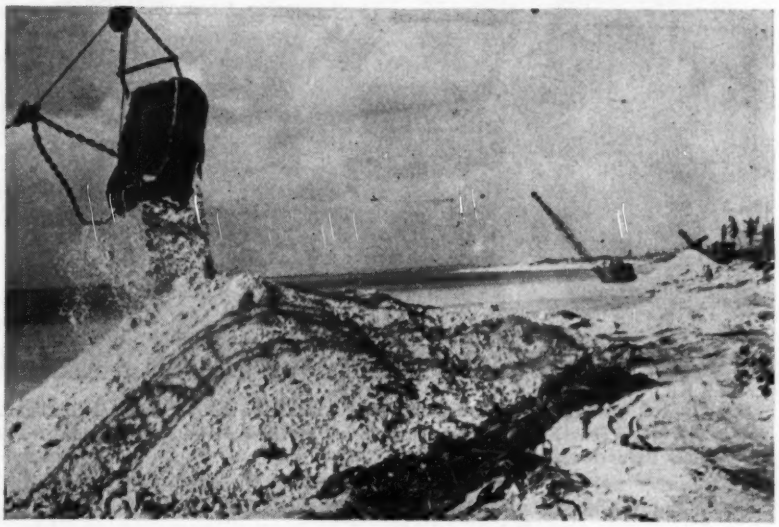
Even so, grading on a 150 x 6,500-airstrip can easily amount to a arter million yards. Endeavor is ade to balance cut and fill as much possible, of course. Usually the ly surfacing material available is oral. But coral is good enough hen properly handled. On well-rained subgrades many coral run-ays are giving excellent service un-er our heaviest bomber loads al-ough nothing but water was used bonding.

Coral, like any other foundation material, must have ample drainage in a country of high rainfall. After clearing, therefore, first attention is given to providing for the escape of surface waters. Often ditches cut with pans or bulldozers serve at first and later are modified into French drains or are made over into V-trenches with easy side slopes.

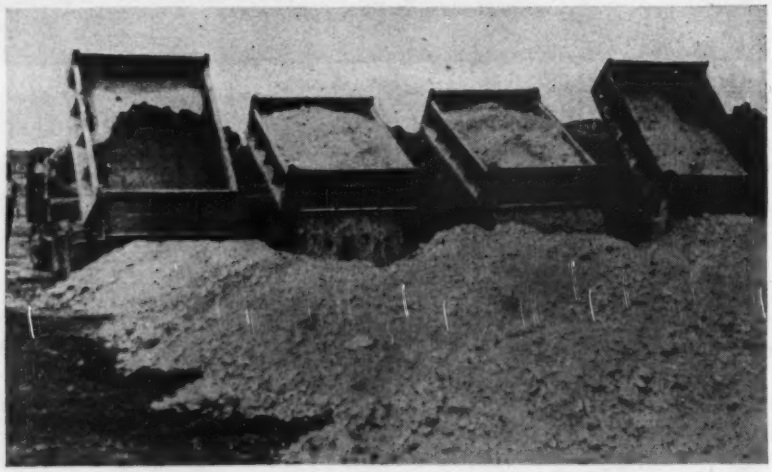
When possible, fills are made in 8-in. lifts, compacted to 6 in., although when the pressure for speed is great, the entire depth is likely to be dumped in at one time, planning to pay the price later in some additional surfacing after settlement has occurred.

In selecting material for the fill comes the first contact with the big question of just what coral is to be used. In the rush of wartime construction it has not been possible to base such selections on exact knowledge or scientific tests. Nor did the Seabees have the advantage of any pamphlets and tables. Available deposits were examined with reference to hardness, color, shape of particles, "feel" and smell. The best coral feels slightly sticky, when properly mixed with water, somewhat resembling the feel of lime mortar. When taken from below water level it frequently has a slight H_2S odor, probably from decomposing animal or vegetable matter.





From below high tide level, coral (at top) is being scooped up and delivered a truckload—2½ cu.yd.—at a time. Draglines (at bottom) bring coral from below water level to stockpiles along an atoll shore line.



Typical coral deposits 20 ft. above sea level are shown above on Espiritu Island, New Hebrides. Trucks sometimes dump coral, as shown below, in parallel lanes for speedy extension of a runway fill.

Frequently small scale tests are made hastily on the runway to see how the material works. Fortunately, where coral is available at all, good coral has often been easy to find. For guidance in selection of coral deposits to be used in future developments, Part II of this article, by Harold T. Stearns, will be valuable.

Preparing foundation and filling with coral are much the same for airstrips or roads. One sharp distinction, however, is that on advanced base roads, which are being constructed while troops and supplies are moving in, it rarely is possible to keep traffic off while the road is under construction. Airplanes, on the other hand, cannot use airstrips before at least the foundation and part of the surfacing is in. For this reason it is feasible to use on airstrips a coral with a higher percentage of clay than would be acceptable on road work. The cementing quality of average good coral will make it "set up" in about three days. Some excellent airstrips, however, have been made with coral that required five days to set. It is highly desirable to get the surface well compacted and firmly set before it is subjected to heavy loads.

Coral that has this desirable setting-up quality, commonly called "live" coral by the construction forces, seems to be activated by the crushing and grinding action involved in breaking it up and working it into the paved surface. Then, under favorable moisture conditions, the setting makes a highly compact slab that will quite satisfactorily turn water.

In building coral airstrips, moisture conditions must be watched closely. Methods of handling the coral not only must be flexible but they must be changed to suit changing moisture conditions. Coral is rarely free from foreign material. A considerable percentage of clay, for example, will cause a reaction to sudden moisture increase, such as a heavy shower, that will defeat the purpose of rolling operations.

Some otherwise excellent grades of coral contain a considerable percentage of clay. The clay content definitely determines how the coral must be worked. As soon as enough moisture gets in to make the clay-moisture combination an unstable mixture, the material will not compact properly. On the field at Munda, New Georgia Island, completed very successfully, heavy clay content was found in some of the most conveniently located pits. Other pits, with little or no clay were located and whenever heavy rains began, a switch was made to the other pits. Sometimes these switches were made at two-hour intervals. The pits drain rapidly and the surplus water quickly escapes from the natural deposits, permitting an early return to the more conveniently located material.

All corals work best with some moisture present. With a considerable clay content there is a definite top limit for moisture, but with clean white coral containing no foreign material (and fortunately there are some excellent deposits of this) it can be placed, spread and compacted in heavy rainfall, if care is taken to maintain adequate drainage and to work the material so as to avoid the sluicing out of fines. On Woodlark Island an airstrip was worked successfully (with pure white coral) during an 11-day period in which 10 in. of rain fell.

Sources of coral

Sources of useful coral may be far above water level, as they are in some parts of the Solomons, or below high tide level as they nearly always are in the low Gilbert and Marshall atolls. A great advantage in handling coral draglined or scraped from below water level is that it comes to the airstrip in thoroughly wet condition. When compacted and crushed into close contact, coral in this condition tends to simultaneously dry and bond into an ideal hard-finished surface.

The durability of a well-compacted al surface is well illustrated by its lity to withstand the accumula- of deep mud on top of the pave- t during heavy rains. The mud ried onto the hard surface by els from adjacent unpaved areas, retain the rain water and keep pavement beneath continually wet le it is being pounded by heavy ic. Good coral paving subjected this test has afterward been ned off with a blader and then been found to need very little re- r. Thus it is concluded that with per support and a well-compacted face, coral pavements can keep isture from going through to the grade.

Excavation and compaction

Condition of the material in a al borrow pit must govern the thod of handling that will be used. e best quality is often in deposits hard and well-bonded that they uire to be dynamited or at least oken up with a rooter before the ns can load it. On one job where all rooters were not strong enough break it up enough to permit pans load, larger rooters were hurried Even though these required ger tractors (D8s) it was well rth while because this combina- n just fitted right and the ma- ial flowed to the airstrip like a eam. The borrow pits that work st smoothly are those in which wer shovels at the face load dump ucks while pans pick up their loads om the floor.

In each borrow pit, variations of quality are expected. Where fine coral with good cementing quality is found it is reserved for top dressing where it fills voids and seals off the surface like a concrete finish. The larger fragments work well in the fills, particularly if they are not too hard to be broken down by the equipment that works the job.

Coral so hard that it will not break up under sheepsfoot rollers does not gain by being rolled with equipment of that type and flat rollers are preferred. However, the very hard coral makes up for the special attention required in handling because it is workable in the wettest weather. In fact, this type works best when well soaked. Sprinkling is required when it is placed in even moderately dry weather.

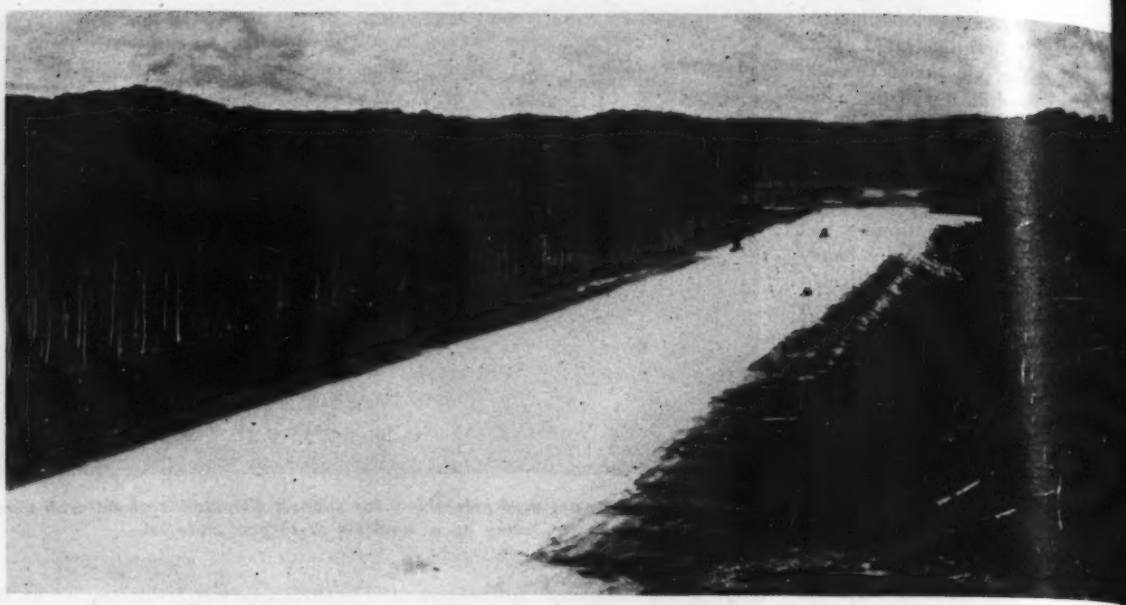
Carrying scrapers are used extensively for uniform distribution of material along airstrips. This one is picking up a windrow of surplus material.

The surfacing of the top 12 in. of a coral airstrip is preferably put on a well-drained subgrade or well-compacted fill in three layers. However, on strips where the time element is of great importance, the entire 12-in. layer has been successfully laid in one operation.

Pneumatic rollers were usually not available for compacting coral airstrips in the Pacific, although many Seabee officers who were experienced in asphalt paving wished to try them out. In the few cases where pneumatic rollers were improvised and tried on soft, moist coral topping, the results were enough better than with steel rollers to warrant recommendation for further use.

Crown, important because of the high rainfall rates, is usually made

On this runway extension, urgent demand for speed brought out all available bulldozers and carrying scrapers.



Typical appearance of finished airstrip (half length) from the control tower. Coral makes sharp contrast with green verdu

a 1½ percent grade, smoothed with a vertical curve over the centerline. The cross drainage must slope both ways from the centerline; attempts at drainage entirely across the strip have brought on surface water from adjoining areas, with resultant rutting.

Although pilots prefer a longitudinal gradient to be zero or nearly so, where construction can be simplified by moderate grades they have been used successfully. One field 6,300 ft. long is divided into three sections, about equal, which have 1½ percent grades sloped alternately up and down. Once accustomed to these changing grades, the pilots soon began to like them because take-offs and landings could be planned to make use of the grades.

Maintenance

Maintenance of well-built coral runways requires less of manpower and equipment than do strips of any other local materials or the Marston steel mat. Fresh raw material, of the proper moisture content is all that is needed to make repairs. On fields near the front the dump trucks used to haul coral are left full at the close of the working day so that in the event of bomb damage to the runway in the night, they will be ready to roll right out on a repair job.

At one field where there are 15,000 ft. of taxiways (mostly on 3½ percent grades) in addition to the main runway of about 6,000 ft. length, the taxiways involve more than usual maintenance because there is no perimeter road and much vehicular traffic uses them. Even so, this field and the taxiways are maintained by six pieces of equipment and their operators, namely, two patrol graders, two rollers and two trucks. Where this field is located the need for sprinkling is rare.

Maintenance is done best after a rain while the coral is still wet. Low spots can be filled in by hand, shoveling from a truck, after which the filled spots are rolled. Such patches, placed wet, bond into the original material almost without a mark. Salt water seems to bond the coral better than fresh water; perhaps the salts serve an anhydrous purpose. When rainfall is sufficient to keep down the dust, one very busy coral airfield goes more than three months without any maintenance at all. Then it is only necessary to give the surface a light smoothing out, fill in the low spots and roll.

In the matter of repairs after bomb hits, coral surpasses other materials to a notable degree. An example is the excellent airstrip on Woodlark Island which received a string of six 125-lb. anti-personnel bombs in a row almost exactly along the centerline. At the same time a similar string fell alongside the runway on an area that had been cleared but not grade Craters in the latter case were 20 30-ft. wide and about 6 ft. deep b cause the bombs had penetrated b fore exploding. Craters on the ru way were so small that all six we filled and repaired with less than truckload of coral.

Where dry weather is likely continue for considerable time, co runways and roads must be sprinkle to keep down the dust and to pr vent serious raveling. In formatio take-offs a dusty field is dangerou because of low visibility; also it bad for motors and the smooth, cu ting edges of propellers. Sprinkli wagons on the runways are a sour of danger and if traffic is at all heav during sprinkling hours they shoul be warned off as planes approach b a siren controlled from the tower.

Asphalt for topping

Asphalt, both hot and emulsifie has been used to some extent in th Pacific on coral runways. However as means of getting excellent result with the coral surfaces have bee developed there has been less asphal used. Later on, however, as there less pressure for speed and mor emphasis on economy in mainte nance, asphaltic toppings may be great help in controlling dust an raveling where rainfall is insufficien to do this.

On Guadalcanal where silt is mor

ommon than coral, the first airfield, uilt in wet weather on soft founda- on, was surfaced with Marston mat. ecause of the lack of suitable undation, maintenance on the mat as excessive. In time the first sur- cing was worn out and replaced ith a new mat surface which, in rn was about ready for renewal as is was written. When an additional nway was needed nearby it was de- ded to haul in coral from a deposit 5 miles away. As in the first work, e major problem was the founda- on. On the soft black silt it was t feasible to lay a reasonably thin yer of gravel as a subgrade for oral—the mud pushed up through e gravel. A successful expedient as to put in a very comprehensive stem of drainage ditches in both rections and then to compact the undation as much as possible. After is a 4-in. layer of non-capillary arth, such as would pass ASHO requirements as "soil-binding material" was put on. This serves as a seal on top of the mud and makes a supporting layer for the 4 in. of gravel next applied. After being worked with a petrolithic roller, the gravel was topped with a 4-in. layer of coral surfacing. The surface so constructed is giving excellent results on the same type of foundation which the earlier, more hasty surveys decided must be surfaced with the steel mat.

Captured Jap airfields have been of little real use to our forces. The Nips show little evidence of a knowledge of soil mechanics and their equipment is unbelievably out of date. Their inclination to be tricky rather than foresighted in a substantial way is well illustrated by what our forces found at Munda, New Georgia Island in the Solomons. Here the Nips put in an airstrip, thinly surfaced and on an inadequate foundation, by doing their work *around* the trunks of the trees in a cocoanut plantation, thus using the trees for camouflage. When they were ready to make surprise use of the field, they felled the trees in the night, dragged off the trunks, leaving an airstrip of considerable size where a cocoanut grove stood the day before.

With this strip was captured the equipment used in its construction. Not a single dump truck was found, what few trucks there were evidently had not been used for hauling material for fill and surfacing. The great number of baskets and hand tools, such as picks and shovels, suggested that except for rolling, hand methods had prevailed. A captured Jap roller which had Japanese characters cast into the framework, indicating that it was one of their regular products, was powered by an American-built gasoline engine.

CHARACTERISTICS OF CORAL DEPOSITS

Harold T. Stearns
Geologist in Charge of Pacific Investigations
Geological Survey, U. S. Department Interior

THE WAR has made the United States onscious of the vast coral deposits n the Pacific. No other rock is avail- ble in large groups of islands such s the Gilberts, Marshalls, Line, and eeward Islands of the Hawaiian rchipelago. The presence or absence of coral deposits with bonding properties may determine whether an island can become an air base. Fortunately, suitable coral deposits are abundant although they may lie under shallow water. "Coral" has become part of the jargon of our armed forces in the Pacific, and many see only coral, water, and coconut trees for weeks on end.

The meaning of "coral" as used by the armed forces varies from island to island; hence, a great deal of confusion has arisen in the minds of the engineers and men in the construction battalions regarding its properties.

Coral to the scientist is the external calcareous skeleton of the coral polyp, an animal whose habitat is in ocean water usually less than 100 ft. deep. It grows in colonies which develop va-

Fringing reef on Guam built almost entirely by coralline algae. The terraces resemble those built by algae at hot springs.

rious forms, popularly known as staghorn coral, disc coral, mushroom coral, brain coral, etc. The skeleton is easily recognized by tiny holes with stellate partitions in which the polyp lived. The polyps are usually less than an eighth of an inch across, but some may be four times that size. They have a great variety of colors, the most beautiful being bright blue, green, or pink. They draw back into the skeleton when touched. The skeleton, covered with these living animals, is live coral. When the polyps are absent the coral is dead.

To the men building airstrips and roads in our Pacific Islands, "live" and "dead" coral have an entirely different meaning. They refer to any white marine deposit that sets up well as "live coral," and any that does not as "dead coral." Little live coral, in the scientific sense, has been used in construction work.

All coral deposits carry, in various proportions, the limy skeletons of coralline algae, plants which encrust coral and commonly bind the coral colonies together to give them sufficient strength to withstand heavy surf and to build reefs. Coralline algae usually form reefs even harder than the animal coral. Thus there is a material available for construction use, commonly called "coral," which in reality has a vegetable rather than an animal origin. The plant skeletons lack the tiny holes so typical of coral. One common variety of coralline algae, when dead, consists of small ball-shaped masses of intertwined worm-like forms of white limestone. In addition to algal limestone, all coral deposits contain shells and their fragments, and microscopic skeletons of foraminifera. Foraminifera skeletons, for example, dominate the wind-blown sand on Canton Island.

Types of Islands

The islands in the Pacific have long been segregated into two major types—high islands and low islands. The high islands are those composed of volcanic rock with or without coral deposits skirting them. The large islands of the Hawaiian, Samoan, Society, Marianas, New Hebrides, and Solomon groups are of this type. The low islands are those which rise only a few feet above sea level and are essentially coral reefs and atolls built over a volcanic basement. The Gilbert, Line, and Marshall groups are of this type.

Types of coral deposits

The coral deposits in the Pacific are tremendously varied but fall into three main types, (1) reef, (2) beach, and (3) lagoon. These may exist well above sea level as compact limestones deposited when the ocean was higher, or as loose or well cemented deposits near or below sea level. All three types have been used, ranging from sediments dredged from the Palmyra lagoon in the Line Group to hard limestone blasted and crushed from ancient reefs 450 ft. above sea level on Guam in the Marianas and on Espiritu Santo Island in the New Hebrides group. In general, emerged deposits have been used in the Tongan, New Hebrides, and Solomon Islands, and submerged deposits in the Gilbert, Marshall, and Caroline Islands. Both types have been used successfully in the Hawaiian Islands.

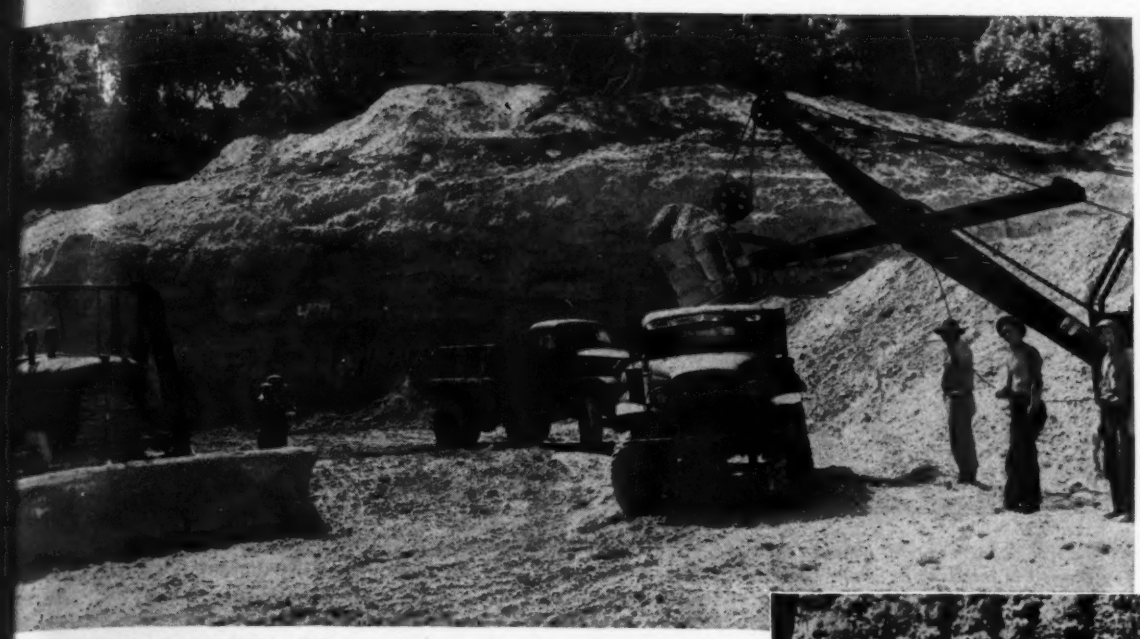
It is obvious, therefore, that whether coral is dredged from the sea or blasted from the land, whether it is a few years old or half a million, does not determine its suitability for construction purposes. The writer, after examining coral deposits being worked by the armed forces in widely separated islands, found only three properties common among them, (1) marine origin, (2) high lime content, (3) white or cream color.

Desirable properties

The desirable properties vary with the use. For concrete aggregate, heavy nodular coral in which the center of the skeleton is crystalline calcite with a specific gravity of about 2.7 and previously broken by the waves into fragments under 6 in. in size is the most suitable after screening and crushing. This type is found commonly along the windward side of atolls or in the adjacent part of lagoons. Many of the beaches between high and low tide are veneered with several feet of this material which nature has cemented into a firm slabby rock known technically as "beach rock." This rock can be crushed for aggregate or quarried for flagstones.

Loose calcareous beach and dune sand such as is abundant in the islands in Midway Atoll is useful to make cement, but is too porous and has too uniform a grain size to set up in runways or roads. But a coarser less well sorted beach sand has been used successfully in great quantities to surface roads on Guadalcanal where it is spread thickly over volcanic muds and clays. There it receives enough rain and has enough foreign clay mixed with it to bond well. Coarse beach sand mixed well by disking with volcanic soil, then sprinkled and rolled made a road on Maui island that lasted 12 years with minor repairs.

Examples of dead animal coral. Left to right: Typical coral head showing tiny holes with stellate partitions in which the polyp lived; section of coral head; mushroom coral, and "finger" coral.



Seabees loading coral at Espiritu Santo Island. The deposit is chiefly detrital as few coral heads are in place.

Dead coral deposits forming fringing reefs and lagoon fills in coral atolls are the common "live coral" of the Seabees in the Gilbert and Marshall groups. These are commonly dug up by a shovel or dragline into a causeway. The causeway is then trucked away progressively from the seaward end. This material is a mixture of coral, sand, shells, coralline algae, foraminifera, organic material, and limy mud in various proportions. It is commonly handled in bank-run condition, saturated with sea water. And it is easily handled because it does not require blasting, and usually is the best natural mixture for bonding quickly in runways and roads.

The factors that cause the material to cement are still being studied, but this quality appears to be due chiefly to the presence of fine limy material of silt size. The presence of decomposing marine organic material seems also to assist cementation by the release of organic acids which react with the lime. However, organic matter is not necessary. Proof of this is in the roads of Guam which are made of crushed reef limestone free of organic material.

Rainfall and the admixture of foreign material play a part also. The rain falling on coral islands contains ocean salts derived from evaporating spray and carbon dioxide dissolved from the air. Ocean spray, alternately wetting and drying loose rocks, will cement them into firm conglomerates. Calcareous dunes, covered with vegetation, are cemented by rain water carrying organic acids from the decomposing vegetable matter. Such dunes, common in Bermuda and the Hawaiian Islands, are usually hard at the surface, but weakly cemented several feet below. The sand in calcareous dunes usually cements around roots penetrating it. Tubes of bone-like limestone ¼ in. to 2 in. in diameter, formed in this manner, are commonly mistaken for coral or fossil bones. Thus natural cementation is caused by the precipitation of lime in the interstices of the deposit. The rate of natural cementation is determined by such factors as texture, climate, organic material, carbon dioxide, and movement.

Many of the runways are sprinkled with sea water to hold the dust, thus aiding cementation. Sea water is already saturated with lime, but upon evaporation leaves its salts in the interstices of the runway. Consequently coral deposits with large interstices or with small proportions of fines, cement slowly if at all, unless vehicles are run over them to increase the percentage of fines by attrition. The rate of evaporation, the humidity and the rainfall become factors in islands where this treatment is used. If the rainfall is low the salts, chiefly sodium chloride, accumulate in the coral interstices and deliquesce, thereby keeping the surface moist. Moisture is an important agent in the bonding process.

Texture of bank-run coral at bay road pit, Espiritu Santo Island.

In New Georgia and similar islands where the rainfall is heavy, coral runways cement with rain water. Thus, fresh water as well as salt water causes bonding. The rate of bonding may be increased by volcanic mud present as original impurities in the coral or by mud tracked on the runways or roads. The volcanic muds aid by filling the interstices and holding

Precast Arch Ribs for an Auditorium Roof

William L. Zeigler
Structural Engineer, Robert & Co., Inc.
Corpus Christi, Texas

***Contents in Brief**—Three-hinged precast concrete arch ribs were used to span 90 ft. with a 26-ft. rise. The crown hinge is a short piece of 10-in. dia. pipe welded to the reinforcing of one half rib section, while the other rib section bears on the pipe. Lower ends of the arches are rounded to fit in circular bearings in precast seat blocks. Roof framing is wood.*

PRECAST CONCRETE ROOF ARCHES were used recently in building an auditorium-gymnasium at a Southwest naval training station when the completion schedule dictated the use of materials quickly available. Heretofore, similar buildings had been designed with glued laminated wood roof arches, which required little steel and no structural timber. When the timber arch fabricators could not guarantee delivery in time to meet the building schedule, precast concrete arch ribs were selected as the best alternative.

A preliminary layout indicated that an arch of 90-ft. span and 25-ft. rise would satisfy space requirements. Parabolic-shaped, three-hinged precast ribs of 9½ x 19-in. cross section were used to permit the available equipment to do the erection work. They are spaced 15 ft. 8 in. on centers.

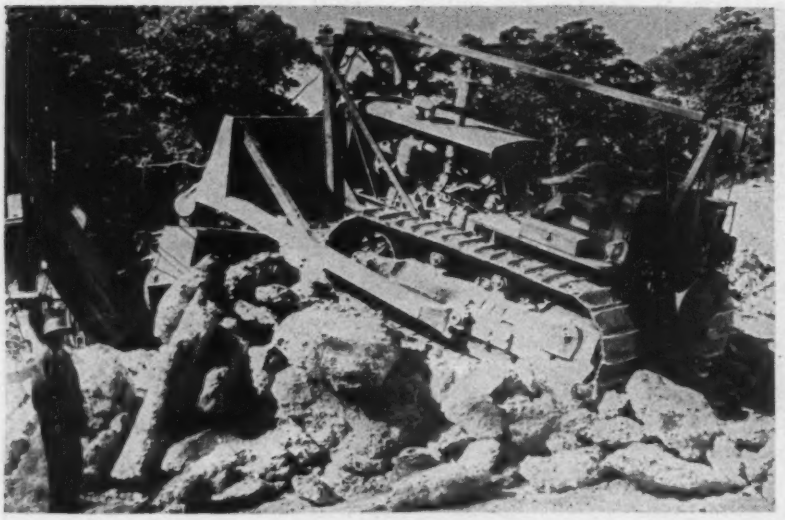
The roof of the building is of simple design. The joists are 2x10-in. timbers on 24-in. centers. They are notched 2 in. at the ends to serve as spreaders to provide lateral stiffness for the ribs. Added stiffness is provided by sway frames on 10-ft. centers and bolted to the ribs top and bottom (Fig. 1). The roof sheathing is 1-in. material laid diagonally, being covered with a built-up, 15-year roofing.

An analysis of the 9½x19-in. rib using a horizontal wind load or a live load on one-half the arch showed that two ¾-in. dia. round bars and one ⅝-in. round bar would provide sufficient reinforcing top and bottom. This amount of steel, 1.3 percent of the cross section, was in excess of that required to satisfy erection stresses. Ties, ⅜-in. dia. on 12-in. centers with every third tie welded to the longitudinal bars, were added to provide sufficient shear resistance and to hold the curved longitudinal bars in position.

The crown hinge consists of a 10-in. dia. standard pipe and two ¾-in. plates (Fig. 2). The 10-in. pipe was placed in the forms and welded to the reinforcing for the left half of the rib. The right half of the rib was cast against the 10-in. pipe, which was greased to prevent bonding. This procedure assured a true bearing fit and reduced the formwork. In erected position the half ribs are connected at the crown by a pair of ¼-in. steel plates bolted to the right hand half section and engaging the ends of the 10-in. pipe in a loose fit. Cotter pins through the pipe outside of each plate hold the half arches in alignment.

At the abutment footings the ribs are semicircular in shape to match precast seat blocks. Forms for the circular bearings were made by using a 16-gage steel plate bent to exact radius, the ribs being cast against the

Fig. 1. Precast concrete arches of 90-ft. span and 25-ft. rise for an auditorium were constructed as three-hinged members. Note the timber sway frames between the ribs, the frames being on 10-ft. centers.



Hard coral deposit several hundred feet above sea level on Espiritu Santo Island. The deposit is loosened by rooters and blasting, and the large blocks are crushed by heavy tractors.

moisture. Most volcanic muds have bentonitic properties to some extent, and can absorb and retain large quantities of moisture.

It is concluded from the data at hand that almost any coral deposit can be used effectively with the proper treatment, but that some factors are beyond economic control. Thus, the failure of certain deposits to set up well in the coral atolls may be due to lack of heavy rainfall, to lack of volcanic impurities, or to improper mixtures of coarse and fines. In general, submerged coral deposits containing a goodly proportion of limy muds are the most economic to handle. They set up most rapidly and, with them, best results are attained by salt-water sprinkling. Field tests should be made on islands where both fresh and salt water are available to determine their relative merits. Salt-water sprinkling may have no value in wet islands where the salt is leached frequently by rain, but moisture seems to be the most important factor in bonding where sufficient fines are present.

Strip tests should be made on runways by adding fines of (a) coral mud, (b) volcanic mud, (c) organic fertilizers, to determine the value of these substances in accelerating cementation. Other strips should be tested with steel versus pneumatic rolling. Reports of a few engineers indicate that pneumatic rolling has advantages over steel rolling. This should be checked because experiences reported might be due to the character of the particular coral used in those islands.

Arkansas Rebuilds Bridges and Roads Damaged by Last Spring's Floodwater

Nine contracts totaling $194,000 have been awarded by the Arkansas State Highway Commission for reconstruction of county roads and bridges destroyed or damaged by disastrous floods of last year. The program includes five road grading and gravel surfacing projects, and four bridges. Plans for three additional bridges have been completed.

Construction costs of all twelve flood damage projects will be financed from federal funds under the War Emergency Relief Program. Priorities for necessary materials were approved by WPB last January. All but one of the projects are on county roads.

Field surveys, design plans and specifications were prepared by the Arkansas State Highway Commission, which also will supervise construction. Counties in which the projects are located will furnish right-of-way and reimburse the state for its design and construction expenditures.

All bridges will have a 12-ft. clear roadway for one traffic lane. Bridge projects on which contracts have been awarded include: A reinforced concrete deck girder bridge of three 40-ft. spans over Patty Creek in Johnson County to A. C. Campbell Co., Shreveport, La. for $12,900, and a treated timber bridge 77 ft. long over Running Water Creek in Lawrence County to W. W. Keaton, contractor, Hope, Ark. for $5,100.

The other bridges now under contract include five 40-ft. reinforced concrete deck girders and two 100-ft. reused steel truss spans over Illinois Bayou in Pope County to the A. C. Campbell Co., for $35,700, and 227 lin. ft. of treated timber bridge over Six Mile Creek in Logan Co. to the D. F. Jones Construction Co. of Little Rock for $11,300. Bridge contracts include graded and graveled approaches.

The three bridges not under contract include: A 392-ft. treated timber trestle over Plum Bayou in Jefferson County, estimated to cost $23,000; a bridge over the Little Red River in Cleburn County having one 304-ft. main suspension span and two 38-ft. side suspended spans, to cost $40,000; and a bridge over White River in Carroll County having a 304-ft. main suspension span and two 64 ft. side suspended spans. This bridge is estimated to cost $50,000.

The five grading and graveling contracts also cover minor drainage structures. They include: 5.4 mi. in Independence County, awarded to Galloway and Jeffery, contractors, Batesville, Ark., for $11,300, and 2 mi. in Logan County to D. F. Jones Construction Co., Little Rock, for $10,000. The latter company also has a contract for 4.8 mi. on State Highway 33 in Prairie County for $32,200.

Reynolds & Sutton, contractors, Tyler, Tex., have two road contracts. One covers 11.0 mi. in Yell Co. for $46,900 and the other is for 8.2 mi. in Pope and Conway counties to cost $27,400.

W. W. Mitchell is director and chief engineer of the Arkansas Highway Department. N. B. Garver is bridge engineer and H. F. Bastian is senior highway engineer.

to connect the ribs. Cast-in-place diagonal bracing, poured integrally with the struts, was also used in the end bays.

When all the bracing and struts has been poured, and the forms removed, the notches between the abutments and the sides of the greased rib seats were filled with grout. A close-up view of abutment before grouting is shown by Fig. 3. When the grout had hardened sufficiently, all protruding grease was removed and a coat of white paint applied.

Final operation was construction of the floor. A 6-in. reinforced base-slab was laid and surfaced with a membrane waterproofing then 2 x 4-in. wood screeds were laid to support a double wood floor.

The precast members were designed for a 3,000-lb. concrete and a maximum reinforcing steel stress of 18,000 psi. For the other members a 2,000-lb. concrete was used, with an allowable steel stress of 24,000 psi. Joists and other structural timber are of 1,200-lb. stress grade.

The auditorium was designed and built under the direction of Captain G. R. Brooks, (CEC) USN, officer in charge of construction, Naval Air Training Center, Corpus Christi, Texas. Lt. Comdr. M. B. Orr, (CEC) was resident officer in charge of construction.

Construction was done by Brown-Bellows-Columbia, contractors, under the supervision of L. W. Boyd, superintendent of building construction.

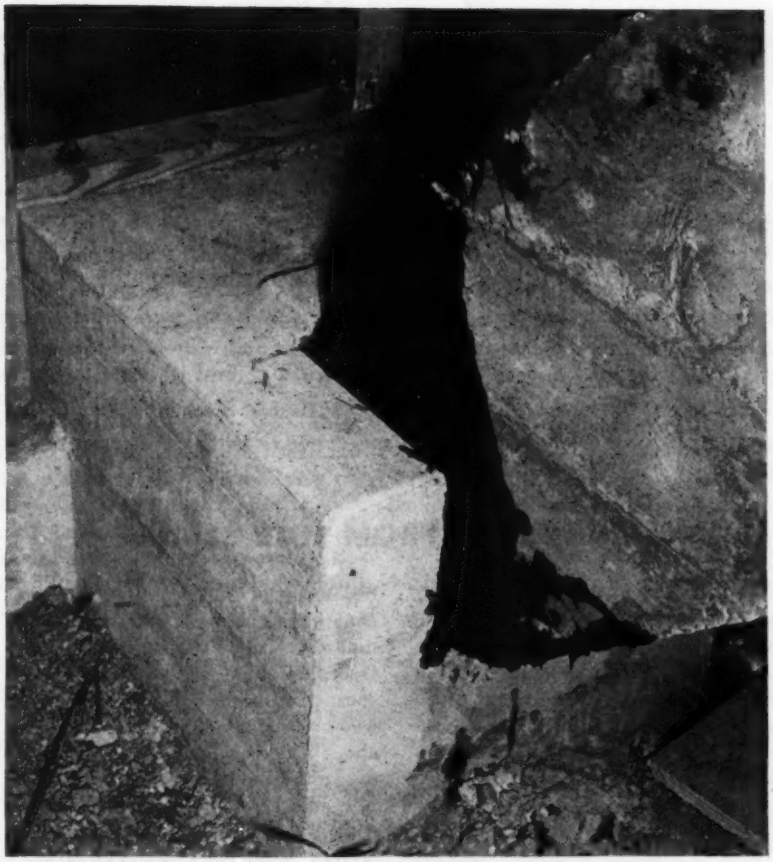


Fig. 3. Rounded lower ends of arches, which were greased to aid rotation during erection of rib sections, fit into precast seat blocks.

H. W. Howarth was project manager for Robert & Co. Inc., the architects and engineers for the training center. Structural design and details of construction were under the direction of the writer, who was manager of the structural engineering department for Robert & Co.

Milwaukee Approves Long Term Financial and Public Works Program

Milwaukee's city council recently adopted a resolution approving a public works program providing for the expenditure of more than $22,000,000 in the next six years. The resolution also sanctions annual review and revision of the long-term financial and public works planning; continues work of the technical committee which prepared the program; instructs the committee to revise a six-year program annually, extending the program one year in advance; and states the projects will be included in the annual budget as capital budget items after consideration by the board of estimates.

The technical committee's program includes $6,200,000 for sewers; $3,805,000 for new bridges and public buildings; $3,025,552 for street openings and widening; $3,000,000 for lake front development; $1,500,000 for playground developments and $458,000 for grade crossing elimination.

Reserve projects totalling $53,304,000 will be carried out if the public desires to spend the money. These include rehabilitation of blighted areas, off-street parking, and improved access routes to the central business district.

Plans are not based upon receipt of federal or state assistance. Any funds received from other governmental sources would be used to expand the program by moving from the reserve list many improvements which otherwise would be postponed until 1949.

A unique feature of the program is that it can be financed on a cash basis. The city's technical committee predicts higher tax rates, basing the forecast upon an expected sharp decline in income tax revenues after the war and the necessity of spending $12,000,000 to buy new equipment. However, the alternative may be a reduction of the six-year program.

The report, approved by the council, contains graphs, studies of population growth, budgets and other essential information and was prepared by a committee of municipal officials created by the council in 1941.

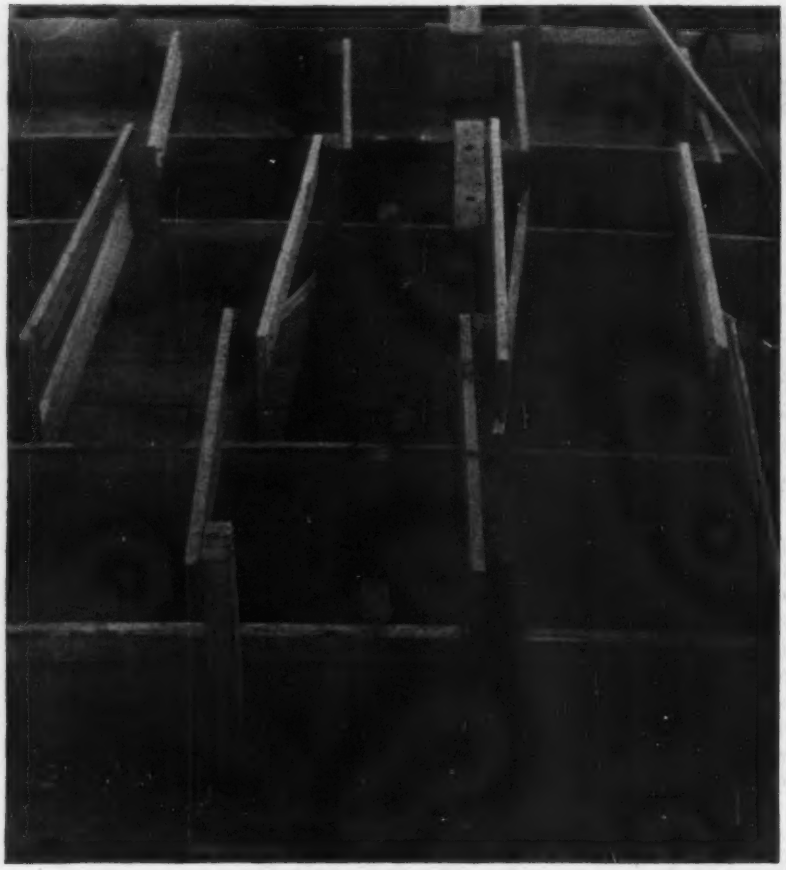


Fig. 2. Ribs were cast in timber forms laid out on a work platform. Crown hinge was made by welding a short 10-in. dia. pipe to reinforcing of one section of rib and by bolting to the other section steel plates (in background) fitting over ends of pipe.

inside, and the seat against the outside faces of the plate. The grade beams supporting the side walls are tied directly into the abutments, which are heavy enough to be stable against overturning and sliding. In addition, it was specified that the abutment footings be poured directly against the side of the excavation and that they be carried a minimum of 12 in. into the underlying stiff, gray clay.

The amount of arch shortening expected due to shrinkage and deformation was calculated, and the layout of the forms adjusted to accommodate this change. After erection of the ribs a check showed the centerline of the pins to be within $\frac{1}{16}$ in. of the calculated height.

To expedite form construction, a diagram showing offsets at 5-ft. centers was prepared. The arch forms were laid out on a level wood platform placed on the ground inside the building, the platform providing the bottom form. The side forms were secured to the platform.

On the upper side of the rib sections, which weighed about 6 tons each, $\frac{1}{2}$-in. dia. bolts 8 in. long were cast in the concrete on 3-ft. centers to permit 2x10-in. nailers to be secured to the arches. Bolts for the sway frames and bracings were cast in the lower side of the ribs. In addition, lifting eyes were provided at the outside quarter points of each half arch.

In order that all the concrete could be poured in one day, the contractor elected to make up forms for all the arches. Regular portland cement was used, which caused no delay, inasmuch as the ribs were poured as the first phase of the job. A membrane curing process was employed, and the ribs were allowed to stand 18 days before erection.

While the ribs were curing, the footings were constructed, together with all grade beams. The precast concrete seat blocks were poured in conjunction with the arches. After curing, the seat blocks were positioned accurately to line and grade. Later they were grouted in position on the abutments.

Erection with two cranes

As the arches had been cast on the subbase for the auditorium floor, the first erection operation was to move all rib sctions outside the building, with the exception of one full arch. Erection of the ribs was done by two crawler cranes, one of 1-yd. capacity and one $\frac{3}{4}$-yd. unit. As the smaller rig was not capable of lifting a half arch section, it was used only for raising the crown end of the rib section after the lower end had been placed in its seat block by the larger crane.

After placing the right half-rib in its seat block, and lowering the crown end until the rib could be supported by short wood shoring, the larger crane moved over to the other side and picked up the other half-rib. This section was placed in its seat block and the crown raised to its approximate height. Simultaneously the smaller crane raised the right half-rib, using only the upper lifting bolt, the lower end being supported in the precast seat block.

A heavy grease was applied to both the seat block and the rib bearing end to reduce friction as the rib was raised. When the crown ends were at the proper height the $\frac{1}{4}$-in. hinge plates were slid over the protruding pipe pin, bolted to the opposite rib, and the cotter pins placed. One rigger, riding on the half-rib as it was raised, made the top connection.

The first complete arch section was guyed in both directions with $\frac{5}{8}$-in. cables tied to buried anchors. Subsequently erected sections were connected immediately to the preceding ones by preassembled timber sway frames. Placing of the prenotched joists and the diagonal sheathing followed immediately. This procedure reduced to a minimum the need of guying by cables and enabled erection to proceed rapidly, nine complete arches being erected in $1\frac{1}{2}$ days. An end view of the building with arched ribs, joists, sway frames and part of the diagonal sheathing in place is shown by Fig. 1.

After all ribs and roof sheathing were in place, a line of cast-in-place concrete struts was built 7 ft. above the floor on each side of the building

Notes on Waterworks Developments

***Editor's Note**—At the 64th annual conference of the American Water Works Association, held in Milwaukee June 13-16, several papers presented at the technical sessions claimed special attention. Among them was a discussion of a new method of reclaiming calcium carbonate from water softening sludge and a description of the so-called diatomite filter developed for army field troop use.*

Extracts from these as well as other papers are given in the following summary. For a news account of the convention, including the names of the officers and recipients of awards, see ENR, June 22, p. 903.

BYPRODUCTS FROM LIME SLUDGE

THE PROBLEM of lime sludge disposal arose in connection with the operation of a 22 mgd. water softening plant at the Wright Aeronautical plant at Cincinnati. There were no plants of appreciable size in this country where water softening sludges were successfully handled on a commercial scale either for the recovery of calcium carbonate in a purified form or for the purification of calcium carbonate to the extent that lime burning could be considered practical, and this led to studies and pilot plant tests.

These revealed that it was economically feasible to recover calcium carbonate as well as burn it to produce lime suitable for re-use in the water softening process. Furthermore, an investigation of the calcium carbonate market indicated that a finely divided calcium carbonate could be sold locally for soil sweetening, as a filler in the manufacture of roofing material, plastics, rubber, paint, millboard, etc. The calcium carbonate could be sold for $5 to $8 a ton, provided a satisfactory particle size could be assured. Lime is purchased at the plant at $8.60 a ton.

Calcium carbonate recovery

Since the capital investment required for calcium carbonate production is about two-thirds that required for lime burning, and inasmuch as the installation was to be made at an industrial plant, the decision was made to proceed with the installation of the calcium carbonate recovery system rather than the lime recovery.

The recovery plant designed for the treatment of waste lime sludge includes thickeners, a centrifuge, a pug mill mixer and a two-stage flash drier. Operation is as follows: Sludge discharged from the softener units in the water treatment plant, containing about 5 percent solids, is distributed to two thickeners, each 26 ft. in diameter and 12 ft. deep. Settled sludge, with a moisture content of about 80 percent, is then fed to a centrifuge.

The centrifuge cake, containing 30 to 35 percent moisture is carried on a belt conveyor to a pug mill mixer. Here dry calcium carbonate from the second-stage flash dryer is added to the wet cake to form a granular mass, with a moisture content of 13 to 15 percent. Then a suction fan system is used to transport the material discharged from the pug mill through two stages of flash drying from which calcium carbonate emerges with a moisture content averaging 0.25 percent. In this condition it is bagged.

Among other things, the investigation leading to the design of this plant revealed that a continuous centrifuge would not only dewater the sludge but would also effect a clarification of the sludge, acting to deflocculate the mass, and thus segregate the calcium carbonate component from all other impurities including magnesium, iron and aluminum compounds, silica and organic matter. Previous work in the field of lime sludge dewatering had, in almost all cases relied upon the use of vacuum filters.

Now that the problem of purification of water softening sludges has been solved by an economical process, a calcination unit for handling small as well as large quantities of sludge is needed for use in this field. It is hoped that flash calcination or similar methods can be fully developed to make the possibilities of lime recovery fully available to the small water treating plants as well as to the larger installations. Possible recovery of the carbon dioxide from such calcination processes will prove of interest to the larger installations, for production of "dry ice" or for other industrial applications, or for recarbonation of the water in the treatment process.—R. T. SHEEN, *associate director, W. H. & L. D. Betz, Philadelphia, Pa., and* H. B. LAMMERS, *assistant plant engineer, Wright Aeronautical Corp., Cincinnati.*

DIATOMITE FILTERS FOR TROOPS

Diatomite filtration equipment, developed by the Engineer Board of the Corps of Engineers, has advantages in the quality of water produced and in the capacity of the filter per unit of weight and per unit of volume. While these characteristics are particularly desirable for military equipment they are certainly not undesirable in other applications and it will be interesting to see how far this new development will project itself into the broad field of water purification.

The need for better filtration equipment arose from the failure of sand filters to remove cysts of *Endamoeba histolytica* at the high rates of filtration employed in the field. At rates ranging from 6 to 12 gpm. per sq. ft. many cysts passed the filters. On the other hand, diatomite filtration was found to affect virtually complete removal of cysts under most severe tests.

What diatomite is

Diatomite, sometimes called diatomaceous silica, kieselguhr or diatomaceous earth, consists of the skel-

al remains of diatoms found in abundant geological deposits in a number of localities, notably in California and Oregon. The filter-aid used in water purification is diatomite which has been selected and calcined with or without flux to produce the desired flow characteristics. In dry form as packaged it may weigh 8 to 11 lbs. per cu. ft. After wetting the volume shrinks to an equivalent density twice these figures.

Diatomite as a filter medium requires a supporting base or septum, sufficiently rigid against flexure, permeable to permit maximum flow rates without significant loss of head, but fine enough to support the filter cake. For this purpose, cylindrical elements of porous refractory materials and helically wound wire have been found most adaptable.

Upon such an element a precoat cake of diatomite is deposited by circulating slurry through the unit. The cake when deposited will be 0.06 to 0.09 in. thick if a conventional dose of one to 1½ lb. of filter-aid per 10 sq. ft. of septum is used. This cake is the filter medium through which the water passes and upon which suspended matter is deposited.

Several forms of the filter septum have been proposed by manufacturers and others. In general the cylindrical form has been most promising partly because of the inherent strength of the cylinder and the hydraulic flow characteristics. The capacity can be determined by the number of elements used and by their diameter and length. The elements must be spaced so as to permit flow of water around and between them after the precoat cake has formed and allowing for accumulation of body feed.

Two sizes of diatomite filtration equipment have been produced for field use. One has 3.6 sq. ft. of filter area with nominal capacity 15 gpm., suitable for pack transport and weighing 50 lbs. The other has 10 sq. ft. of filter area with 50 gpm. nominal capacity, suitable for motor transport and weighing 350 lbs. The pump in each case, which may be any centrifugal pump within the pressure limits of the equipment, is a separate item. Operation of the filter unit depends only upon the delivery of water from the pump and access to the pump suction. The pump and engine for the pack filter weighs 60 pounds—that for the larger unit weighs 170 lbs.

To construct a diatomite filter it is necessary only to enclose in a filter shell one or more septum elements connected to a common header. The selection of the number, diameter and length of filter elements depends on the size of filter required. Elements are enclosed in a metallic circular container and suspended from a manifold header which is bolted to the top of the shell; the influent enters at the bottom of the shell passes through hte filter elements and out through the manifold collector. The bottom of the shell is conically shaped to dissipate entrance velocities, keep filter-aid (diatomacious earth) in suspension, and to facilitate backwash. Backwashing is accomplished by reversing the flow of water through the filter by a valve to the suction side of the centrifugal pump. Flow of water is upward during filtration and downward during backwash.

Filter shells are designed so that the filter-aid, which enters with the applied water is kept in suspension until deposited on the filter element as cake. Incoming water is directed so as to not scour the filter cake from the septum at one point and deposit it at another. Provisions also are made for quick and complete removal of filter cake from the shell during the backwash period.

An important accessory to a diatomite filter is the so-called body feeder by which filter-aid is added during the filtering cycle. The purpose of the body feed as distinguished from the precoat is to retard the increase in loss of head which, as in any filter, begins relatively low and rises as the removed solids accumulate. By addition of filter-aid slurry during filtration the cake surface grows radially and the porosity is maintained for a longer period.

Development of diatomite filtration equipment for troops has proceeded under unique conditions in that the underlying principles, characteristics and behavior had to be determined simultaneously with development of component parts, methods and technics with an eye to their application in a form suitable for the field.—CAPT. HAYSE H. BLACK *and* CHARLES H. SPALDING, *chief and engineer, respectively, Water Supply Equipment Branch, Corps of Engineers, Fort Belvoir, Va.*

COSTS OF WATERWORKS STRUCTURES

In the preparation of estimates for waterworks construction it is often necessary to make cost estimates well in advance of definite knowledge as to the details of the project. Up to the time plans have been completed, such estimates must be made on the basis of costs of similar plants. Costs fluctuate, and comparative estimates, therefore, must be made with the aid of an index number.

In the following determination of the cost of reinforced concrete reservoirs and filter buildings, the actual costs of completed structures were adjusted on a common price basis, using the *Engineering News-Record* Construction Index. All cost data have been adjusted to the index number 294 which prevailed in September, 1943, and which is approximately the same today.

Index reflects price changes

Regarding the fluctuations over the past 40 years, the *ENR* Construction Index, based on steel, lumber, cement and labor prices, shows little change between 1903 and 1915, when prices began to rise following the outbreak of war in Europe. Shortly after this country entered the war, in 1917, construction costs had risen to substantially double the costs prevailing in 1913. This was followed by a recession in the general price base near the end of 1917.

By the middle of 1920, prices had risen to a peak of 275. Following this peak there was a depression in 1921, when the index dropped to 160. This depression was short, however, and the index soon rose to a little above 200, where it continued until the 1929 crash, when it again fell, reaching 150 by 1932. Since that time, the construction index has increased gradually until it now stands just below the 300 mark.

By compiling the cost data on 31 concrete reservoirs, including the storage capacity, cost per million gallons at the time built, the *ENR* price base when built, and the cost per million gallons reduced to the price base of index 294, it was possible to make a logarithmic plotting of the size of each reservoir expressed

in million gallon capacity and the cost per million gallons on the present price basis.

Reservoir costs

Most of the reservoirs under consideration are of the so-called box type, usually with flat bottoms and vertical sidewalls. In most cases they are covered by a reinforced concrete roof carrying at least one foot of earth, although this was increased in some instances to counteract upward pressure. In a few cases, the construction costs for circular reservoirs were used and, as would be expected, their cost was less than for the rectangular form, although not very much.

In general, the following comparative costs prevailed:

Size—mg.	Cost per mg.
0.5	$50,200
1.0	46,000
2.0	40,000
5.0	32,000
10.0	25,500
20.0	19,000
40.0	10,300

In like manner, it is convenient to estimate the cost of filter plant structures by the cubic foot, and common practice is to use the exterior cubic footage from average height of foundation to average height of roof. By tabulating the actual costs of 18 filter plant buildings, cubic footage, cost per cubic foot when let, price base when let and what the present cost per cubic foot would be if reduced to the present price base of 294, it was possible to make a logarithmic plotting of the present costs per cubic foot. These costs varied in proportion to the size of the buildings as follows:

Exterior Cu. Ft.	Cost per Cu. Ft.
8,000,000	$0.31
1,500,000	0.38
1,000,000	0.40
750,000	0.43
400,000	0.44
300,000	0.46
200,000	0.48
100,000	0.52

As would be expected, the cost of filter plant buildings per cubic foot decreases as the size of the buildings increased.—CHARLES B. BURDICK, *consulting engineer, Chicago.*

DEPRECIATION OF PUBLIC UTILITIES

Although the existence of depreciation is universally admitted the extent to which it is present and the most practicable means of measuring and financing it are highly controversial. Renewed attention recently has been directed to the question as a result of a report prepared by the Committee on Depreciation of the National Association of Railroads and Utilities Commissioners. The recommendations and implications of this report are of such vast import to all utilities and especially to the long-lived water utilities as to warrant the most serious consideration.

Depreciation defined

Among other things, careful consideration of the legal definitions and that of the NARUC depreciation committee shows that whereas the earlier definitions refer to loss in value not restored by current maintenance, that is now superseded by "consumption in whole or in part of the service life, capacity or utility of property." Depreciation under this new definition becomes a question of consumption of life rather than value.

The NARUC depreciation committee recommends that where the depreciation reserve actually accrued by the companies is less than the amount which should theoretically be in the reserve on the straight line basis, the reserve should be brought up to the total indicated by the straight line method by withdrawal from surplus or otherwise. Practically all privately owned public utilities have been under governmental regulations for periods varying from 20 to 40 years and their annual depreciation allowances and the credit balances in the reserves reflect the practices either ordered or approved by regulatory bodies.

If the recommendation of the NARUC committee should be followed it would mean that the present water utility reserves amounting to 13.4 percent of book cost would necessarily be increased to from 25 to 35 or 40 percent in most cases. Where is this money coming from in view of the fact that the average waterworks surplus is but 6 percent of its book cost? Is there anything fair or equitable in requiring this change in accounting practice and in the valuation and rate base of the utilities? It seems highly unjust and unethically improper to require such a write-down in values.

The courts have said that depreciation is a part of the cost of service and as such must be paid by the consumer. Now in effect the NARUC committee says to the water utilities, "you must double or triple the amount which regulatory bodies have permitted you to set up, and this excess must be taken from your surplus or by omitting dividends rather than collected from the rate payers." There is nothing ethical in that kind of "back-door confiscation."

The NARUC report further states that "The depreciation reserve should not be readjusted gradually through modification of the annual depreciation rates when the difference between the book reserve and the proper reserve (straight line) is substantial." With waterworks this difference is substantial (100 percent or more of the book reserves) so that this stipulation closes the door to the only means of collecting depreciation costs from the consumers according to law. Not being permitted to collect from the rate payers for the cost of property consumed in their service the difference must be taken from capital and the property values are correspondingly impaired. Requiring the utilities to deduct from value that which they were never permitted to collect through rates is contrary to all precedent and ethical procedure.—L. R. HOWSON, *consulting engineer, Chicago.*

Water Interconnections

Fifteen interconnections have been built during the past two years at a cost of $89,700 by the New Jersey State Water Policy Commission. Half the expense was borne by the state and half by the owners of the water systems benefited. Eight connections, having an aggregate capacity of 112 mgd., are in the northeastern metropolitan district. Seven are in the Camden metropolitan area, and their total capacity is 4.4 mgd.

Installations of the interconnections was made in accordance with the provisions of an emergency water supply act of 1942. This act was designed to assure dependable water service to important industrial areas in case of breakdown or other interruption to the regular supply.

The success of this program reflected the cooperative efforts of state officials and local waterworks management groups.—*H. T. Critchlow, chief engineer, State Water Policy Commission, Trenton, N. J.*

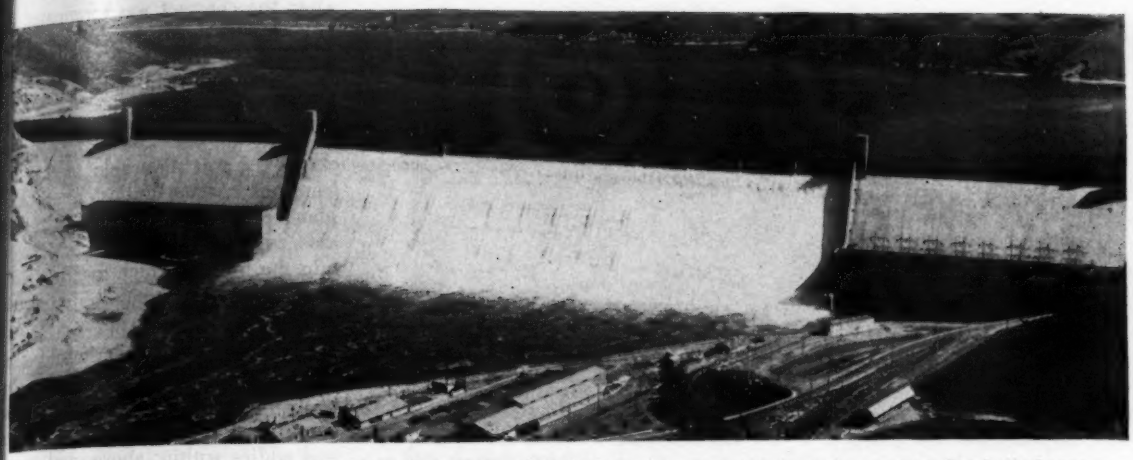


Fig. 1. Spillway of Grand Coulee Dam discharging 65,000 cfs., about one third of the summer flood discharge.

Spillway Erosion at Grand Coulee Dam

Kenneth B. Keener
Designing Engineer on Dams, Bureau of Reclamation
Denver, Colo.

***Contents in Brief**—Inspection of the spillway bucket at Grand Coulee Dam has revealed considerable erosion at certain points which was caused in large part by boulders and gravel drawn back into the bucket from the river bed and by debris from construction operations. Irregular flow during construction accelerated the erosive action. A floating caisson is being built for use in the regular maintenance program, the caisson to be used to unwater sections of the bucket to permit replacement of eroded concrete. Erosion is expected to be reduced as more water is taken for power and irrigation.*

ALTHOUGH MAINTENANCE of the bucket below the overflow spillway of Grand Coulee Dam was expected to present a future problem of erosion control, it was hoped that any major installations for that purpose could be deferred until after the war. In order to determine the amount of scour since completion and flooding of the bucket in December, 1937, an inspection was made by divers in March, 1943. Another inspection to ascertain approximately the rate of erosion, was made in the late fall of 1943. Also, during 1943, a 1:60 operating model of the dam and a short reach of the river channel immediately downstream, was constructed near the dam to study effective means of controlling the erosion, to aid in the design of maintenance equipment, and to better solve other hydraulic problems incidental to the operation of such a large multiple-purpose structure.

Recognizing the interest of the engineering profession in erosion problems at the toe of high dams, the results of the inspections, together with a review of past and future plans, are recorded somewhat concisely in this article.

Fig. 3 is a typical section of the river or central portion of the dam, the outside outline of which extends for 1,650 ft. between the spillway training walls. The section is taken through one of the 11 drum gates and through one of the 20 tiers of three outlet conduits, these being the only outlets, except the power penstocks through the abutment portions of the dam. With all drum gates down in their open position and a reservoir water-surface elevation of 1,290.5, the spillway has a maximum capacity of 1,000,000 cfs., more than twice any flood of record. That capacity corresponds to a flow of slightly over 600 cfs. per foot of spillway length. With a drop of 280 ft. from the reservoir water surface to tailwater, the theoretical energy created at the toe of the dam amounts to 19,300 hp. per lin. ft. or a total of 31,845,000 hp. over the entire reach between the training walls.

With the aid of hydraulic model tests, the spillway bucket was designed to dissipate the enormous amount of energy that otherwise would be expended in disastrous under-cutting at the toe of the dam. A cross-section of the final design as constructed, is shown in greater detail in Fig. 3.

The principle upon which the bucket functions is of interest. The falling sheet of water is diverted by the circular base of the bucket and emerges along the 1:1 downstream slope. Upon reaching the lip at El. 900, it divides into two parts, one of which continues in an elliptical motion upstream and the other in a similar downstream motion (Fig. 2). The upstream and downstream rollers thus formed, in and below the surface of the tailwater, result in the de-

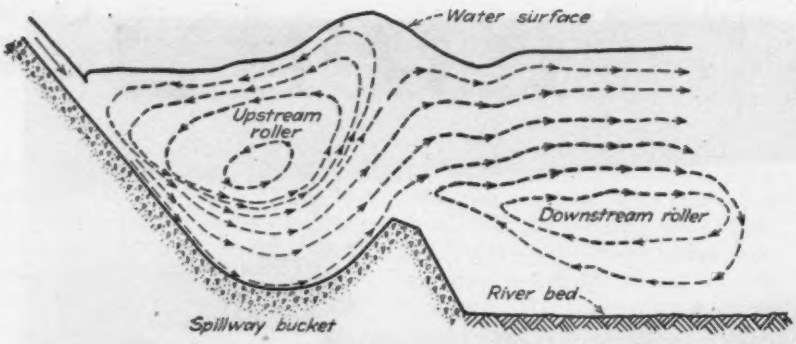


Fig. 2. Sketch showing the manner in which energy is dissipated at the toe of Grand Coulee Dam.

sired expenditure of energy. The model tests indicated that for a discharge of 500,000 cfs. down the spillway, the maximum velocity upon entering the tailwater was 133 ft. per sec., and only 55 ft. per sec. at the downstream end of the circular base of the bucket.

Fig. 4 is a photograph showing about 1,000 ft. of the bucket shortly before cutting of the unwatering cofferdam and permanent and complete flooding on Dec. 15, 1937. Since that date, although water did not flow over the top of the spillway drum gates until June 1, 1942, the bucket has been in practically constant use. During the remainder of the construction period after completion of the bucket, the river flow, except the comparatively small amount required for the development of power after March 22, 1941, passed the dam through the outlet conduits and through open channels over the top of the uncompleted mass concrete. Also, for a period of 13 months prior to complete flooding, the river flow passed through open channels over the top of the partially completed dam and over the left 420 ft. length of bucket. Thus, it may be observed that until the first inspection in March, 1943, a fourth of the bucket had been in use for about 6½ years, and that the entire bucket had been subjected to heavy use for over 5 years. During the latter period 346,000,000 acre-ft. of water passed over the bucket, an additional amount of 10,000,000 acre-ft. passing the dam through the turbines of the left powerhouse.

Debris in the bucket

Although all debris was removed from the bucket prior to flooding and precautions were taken to prevent the dropping of materials and equipment into the bucket during the remaining construction period of 4½ years, it was known that, unavoidably, some heavy objects had fallen into the water at the toe of the dam. Naturally it was surmised that a greater unobserved number of such articles were in the bucket. By its very location at the toe of the dam, to be constructed an additional 440 ft. above its trough, it was a natural "catch-all" during construction operations.

Under the specifications, the contractor was responsible for the removal of any foreign material in the bucket as a result of his operations. That responsibility was recognized definitely in the final adjustment, when the contract was terminated in 1942 before final cleaning-up in order that the contractor could use his personnel and equipment on other urgent work in connection with the war. Furthermore, the Bureau of Reclamation was agreeable to that release of responsibility as it had planned for early installation of suitable equipment with which to maintain the bucket, which could be used readily in removing objectionable deposits.

Also, during the period of construction of the dam, the bucket was of necessity subjected to uneven flow conditions, causing cross currents and eddies within, above, and in the river channel immediately downstream from the bucket. When work was underway in placing concrete on parts of the river section of the dam, and in installing certain of the various outlet works and spillway drum gates, it was imperative that the flood waters be passed over the low blocks of the dam or through completed outlet conduits, well away from the work in hand.

The resulting uneven flow condition had its effect on the alluvial river-channel topography downstream from the bucket. Transverse currents within the bucket were common. When the river flow was changed

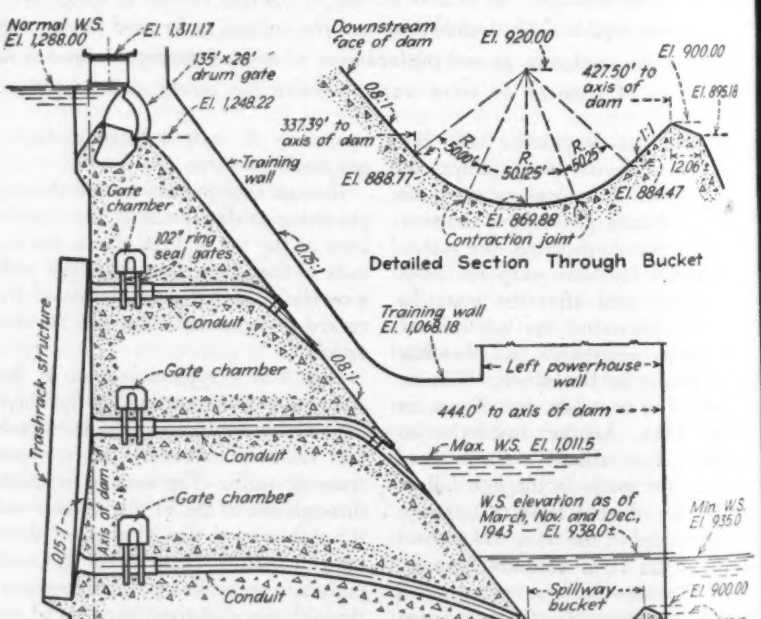


Fig. 3. A section through Grand Coulee Dam showing the spillway and the bucket, also details of the spillway bucket.

from one location to pass over or through another part of the dam, the natural tendency was the formation of eddies and cross currents, which in attacking bars formed by previous flow conditions resulted in sedimentary deposits in the bucket. Thus, it may be assumed that the construction period, attended as it was by the passing of about 95 percent of all flood water over or through the river section of the dam, by the deposition of construction debris and by the irregular flow conditions, was more severe on the spillway bucket than any future period of equal duration will be.

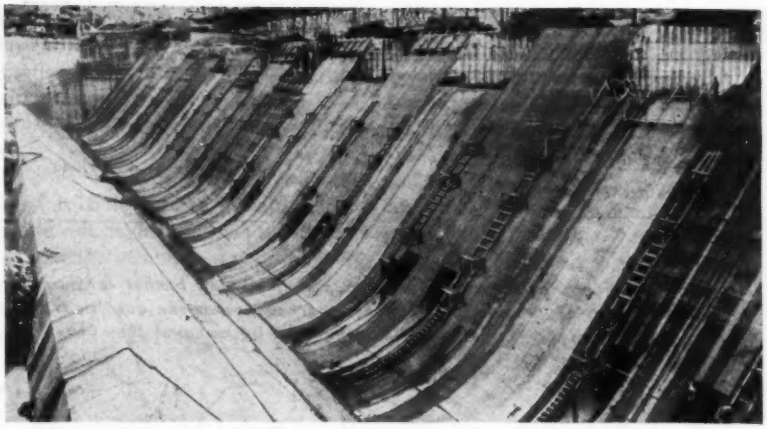


Fig. 4. Right portion of the spillway bucket shortly before it was flooded on Dec. 15, 1937. Its great size is indicated by the men at the lower right corner.

First inspection of bucket

On account of the conditions heretofore described, it became desirable to determine to what extent the bucket had been damaged by erosion. To even inspect the concrete surfaces at a maximum depth of 68 ft. below minimum tailwater surface was no mean undertaking, particularly in view of the low temperature of the water, 37 deg. F., and the turbulence and rapid currents within the bucket.

Accordingly, decision was made to inspect the bucket during the low-water season in March, 1943, by diving operations from a small barge attached to a larger guy-controlled maneuvering barge. Operations were commenced on March 8, and the inspection was completed in 20 days. The divers reported the water relatively clear to the extent that they could see for a distance of 10 to 12 ft. without the aid of artificial light.

Results of this inspection are shown graphically in the upper part of Fig. 5. The block numbering and lettering corresponds with that used during the construction of the dam. The block boundaries, where not representing exterior surfaces, denote formed transverse and longitudinal contraction joints. River-bed contours, taken by soundings during March, are also shown in Fig. 5.

It will be noted that pronounced erosion was quite general in the I and J blocks throughout the length of the bucket, except in rows 31 to 34, in the vicinity of the left training wall where it was much lighter. The most extensive damage was in block rows 37 and 38, in rows 52, 53, and 54, and in block 64J and the adjacent right training wall. Cross-sections in Fig. 5 show more clearly the extent of the erosion at some locations.

Several isolated deposits of sand, gravel, and boulders were found within the bucket and, generally, river-fill material was packed against the downstream face of the lip of the bucket almost to the apex at El. 900. It was impracticable to inspect the surfaces covered by those deposits.

Samples of deposits taken from the bucket during the inspection operations are shown in Fig. 6. The two short pieces of badly-worn steel were cut from the ends of a 15-ft. length of sheet piling recovered from the 43J block. Incidentally, five pieces of interlocked sheet piling, varying from 5½ to 21½ ft. in length, were removed from the smoothly eroded surfaces of the I blocks in rows 43 and 44. The object shown in the upper right hand corner of Fig. 6 is a severely-ground 18 x 25 x 2 in. thick brass plate which was found in row 54 of the bucket. The other exhibits are representative specimens of rounded boulders, the largest being of granite, with a maximum cross dimension of 24 in., from block-row 54. The smaller egg-shaped samples having maximum dimensions of 12 and 7 in. were recovered from rows 55 and 40, respectively.

Maintenance program

The conditions disclosed by the inspection were reassuring in that they did not indicate any early danger to the safety of the dam. On the other hand, they were sufficiently significant to warrant proceeding under an orderly program with the plans for bucket maintenance, without delaying further for the war's termination. These comprise a floating submerging-type caisson; a permanent drydock, ¼ mi. downstream from the dam on the right bank of the river, for erecting, maintaining, and housing the caisson; and a guide and hoist-operated cable system for maneuvering the caisson into position over the bucket.

In design, the caisson is a steel structure rectangular in plan, about 58 x 114 ft. in overall outside dimensions, and is provided with a series of tanks or compartments, which by emptying or filling with water will cause it to float or submerge. The bottom of the caisson is open and fits the configuration of the bucket. Rubber seals, installed completely around the bottom rim, will prevent excessive leakage into the lower working chamber after the water has been removed by pumping.

The drydock, circular in plan with an exterior diameter of 163 ft., will be of reinforced concrete. The plans provide for building that structure above the partially excavated ground at the site, and then excavating and sinking it some 80 ft. to rock by open-caisson methods. For that purpose, a steel cutting edge will be installed around the bottom periphery. Excavation of a short channel will provide access from the river to the drydock. The inlet to the drydock will be controlled by miter gates.

The floating-caisson equipment, when completed, will serve for thorough and regular inspections and a continuing program of making any needed repairs to the bucket during the annual low-water seasons. In ad-

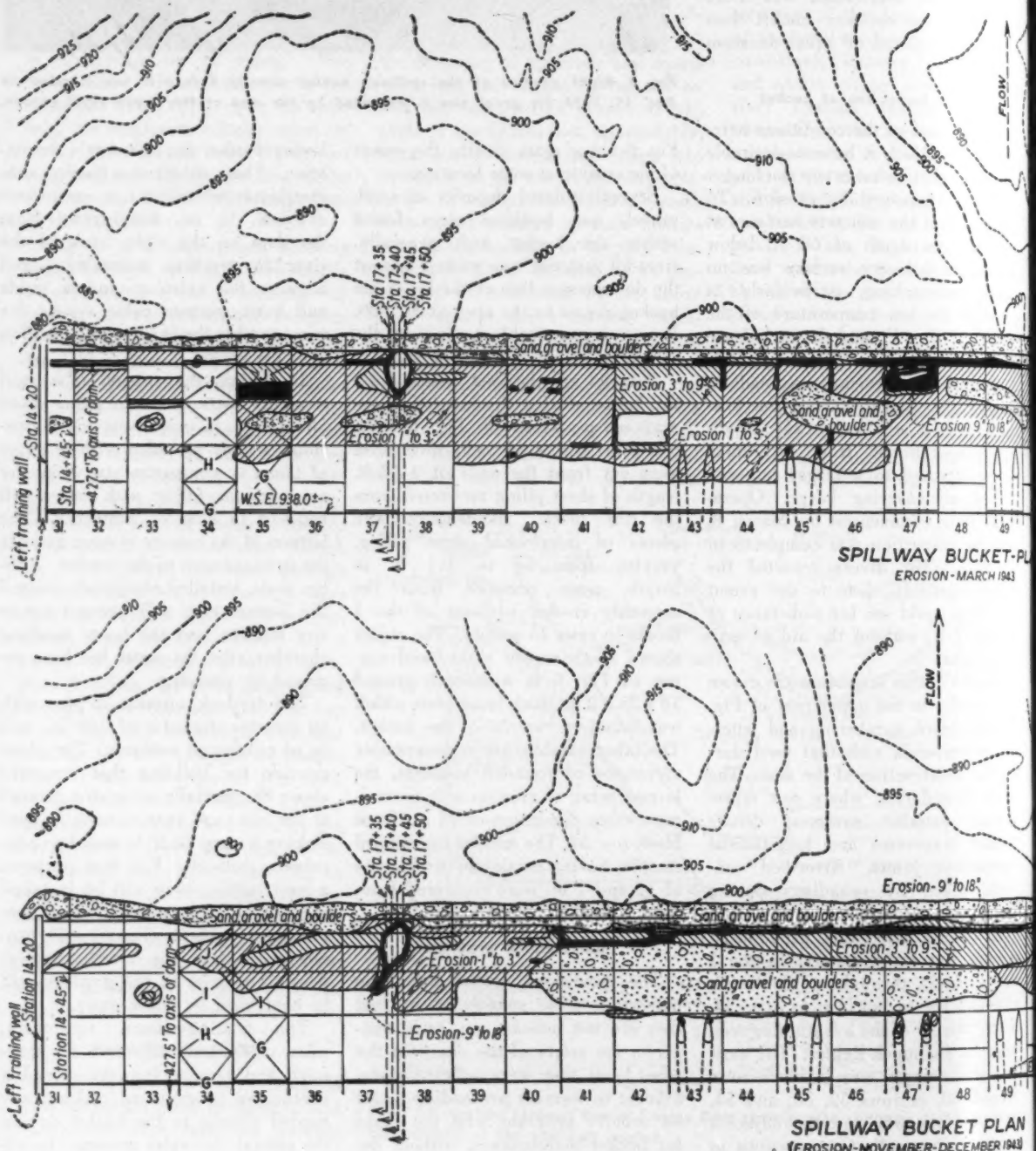
dition, plans have been consummated for river control at the dam, which will mitigate future erosion and at the same time lengthen the anual periods during which it will be unnecessary to pass flood water directly over the bucket.

On account of the cross-currents engendered by operation of only part of the spillway gates, the repair operations may be more readily accomplished when there is no discharge over or through the spillway section of the dam.

Changing flow conditions

The most critical period of handling river discharge over the bucket passed with the completion of Grand Coulee Dam in 1942. However, operating conditions during the succeeding few years cannot be as favorable as they will be after all power units and the pumping plant are completed and in operation. The average annual run-off at the dam, based on 30 years of record, is 77,000,000 acre-

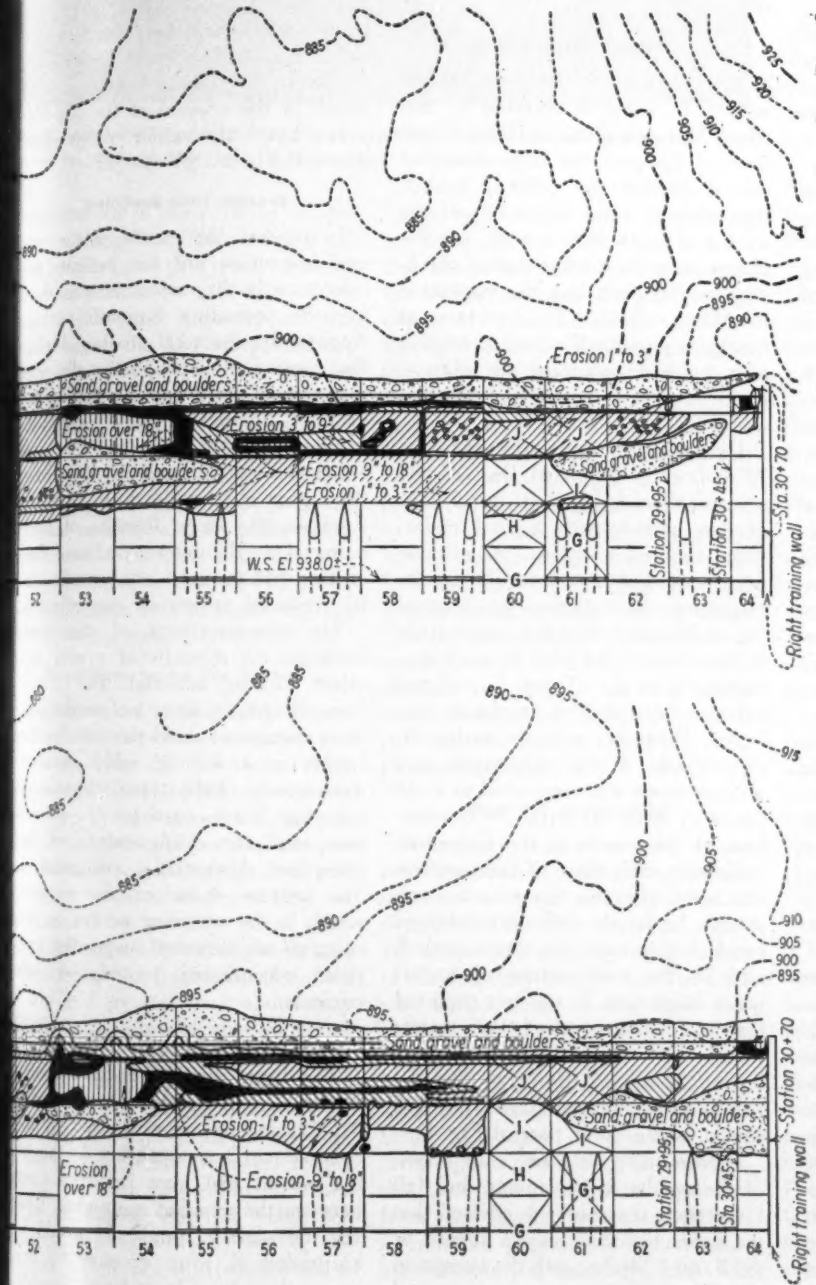
Fig. 5. Location and depth of the erosion in the spillway bucket is shown by the shaded areas, also the position of deposits of gravel and boulders. The upper diagram records the conditions found in March, 1943, and the lower one shows the results of an inspection made in November and December of that year.

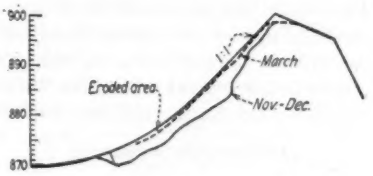


ft. After all power units are installed, releases of water through the turbines can approach an annual maximum capacity of 65,000,000 acre-ft. After the pumping plant and the irrigation project, which the former will serve, are completed, the annual draft on the reservoir through the pumping plant will be roughly 4,500,000 acre-ft. Thus, although recognizing that the power units will operate at less than maximum capacity, it is apparent that in the future a very small percentage of the annual river run-off will pass over the spillway.

The annual maximum capacity in terms of water released through the power turbines now installed in the left powerhouse is about 27,000,000 acre-ft. In order to further reduce the discharge over the spillway for the next few years, it was decided to utilize some 84-in. balanced needle valves, available for the time being from another bureau project, in providing additional outlet capacity through the 18-ft. dia. plate-steel penstocks, originally embedded in the right abutment of the dam for the future units of the right powerhouse.

The eight valves, which have been delivered to the project, will be connected to the downstream ends of all but one of the penstocks by plate-steel reducers and will discharge vertically through plate-steel elbows into the draft tubes that were built into the foundations of the right power-





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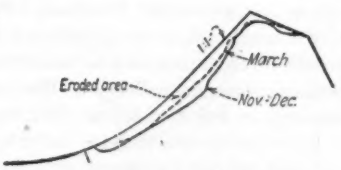

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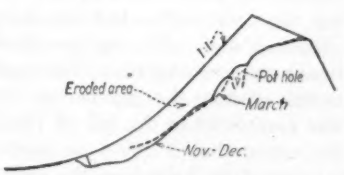

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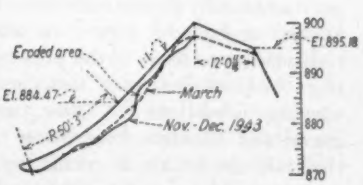


SECTION-STATION 17+50

house for future turbines. Each valve will have a maximum discharge capacity of 4,000 cfs., corresponding to an annual draft of 23,000,000 acre-ft. from the reservoir. Completion of installation of the valves is scheduled for October, 1944.

Simple calculations show that, after these valves are operating, 71 percent of the ultimate draft on the reservoir by other discharges than over the spillway may be attained; whereas under existing conditions that percentage is only 38. Furthermore, the period during which flood water must be passed over the spillway will be greatly reduced, thus allowing a much larger annual period for maintenance work on the spillway bucket.

Maintenance equipment

The tentative construction program calls for completion of the floating caisson and related facilities in the summer of 1945, the objective being to commence maintenance repairs of the spillway bucket in the fall. It is proposed to make another inspection of the bucket about October, 1944. If the results show no significant increase in erosion and war conditions remain acute, completion of the caisson may be deferred for another year.

War conditions, with the incidental difficulty of obtaining suitable materials and equipment, had delayed the construction of a permanent and complete 1:60 operating hydraulic model near the dam. This structure had been planned to aid in determining the most advantageous operating procedure for all river discharges passing the dam and to test the designs prepared for the spillway-bucket maintenance equipment. The model, commenced in the summer of 1942, was completed in the fall of 1943 to the extent that it could be operated for prototype flows over the spillway of 337,000 cfs. or one-third of the spillway capacity.

The gravel deposits in the bucket, as disclosed by the diving operations of March, 1943, the results of the sounding surveys in the river channel immediately downstream from the bucket, and model tests with materials similar to those in the prototype river bed, all indicated that, under varying conditions of flow, sand gravel and boulders were being carried into the bucket by returning or upstream eddy currents. Once in the bucket, the particles, or a portion of them, dependent on their size and weight and the strength of the normal circular currents and the cross-currents, when operation of the spillway discharge was unsymmetrical, were subject to continual movement.

Concluding that partial removal of the source of such material would reduce the requirement for later maintenance of the bucket, dredging operations were commenced and are now in progress in removing river bed material, 100 to 150 ft. downstream from the bucket, to approximately El. 885.

Second inspection

By late fall of 1943, 62,500,000 acre-ft. of water in addition to that which had passed the spillway at the time of the previous inspection had passed through the spillway bucket, that amount being about 18 percent of the 346,000,000 acre-ft. of discharge over the bucket during the 5-year period preceding the inspection in March, 1943. To ascertain as nearly as possible the rate of erosion as a guide in planning the maintenance program, another inspection was made.

Diving operations commenced Nov. 15 and were completed Dec. 23, 83 separate dives being made on 17 days of that period, with a total underwater time of 55 hours. Conditions were somewhat more favorable for the inspection than during the original one in March, in that the temperature of the water varied from 12 to 22 deg. warmer than the 37 deg. F. endured before, and river-flow regulation was better. However, as in the earlier inspection the divers' movements and all operations were restricted to some extent by swift currents. No comparison of the results of the inspection was made with those of the previous one, until after the survey was completed. Under the difficult conditions faced during each inspection period, and by the very nature of underwater inspection, it was not expected that a comparison of the results would be without some inconsistences. It was gratifying to find the results fairly harmonious. They are shown in the lower part of Fig. 5.

Before attempting any comparison of the results of the spring and fall inspections the reader is advised that the latter included only a survey of the I and J blocks, with the exception of a few upstream areas not covered in the former. In block rows 31 to 39 there was little change, except the diagonal upstream extension into the 37I block of the previously deeply-eroded channel in the vicinity of the 37J-38J joint. In rows 40 to 44, inclusive, erosion had increased along the lip of the bucket. A large gravel deposit, of about 3,300 cu. yd. and with a maximum depth of 9 ft., extended along the bucket invert from row 40 to 49. In rows 46 to 49, inclusive, there was a slight increase of erosion along the bucket lip. In rows 45, 50 to 52, inclusive, and 56 to 63, inclusive, there was practically no evidence of additional erosion. A definite increase was found in the erosion at the 53J-54J joint, but only minor progression was noted in nearby row 55.

Erosion rate declining

In general, the results of the second inspection did not indicate acceleration in the rate of erosion during the preceding 8-month period. Apparently, the total erosion during that period was proportionally less than during the 5 years preceding the original inspection, which may be ascribed to the more uniform and relatively less amount of flow over the bucket during the shorter period. Even so, the large deposits of river material in the bucket indicate that erosion will progress abnormally, until remedial measures are effected.

The characteristics of the worn surfaces, the deposits of gravel and other foreign material, the water-worn shapes of those accumulations, the presence of cross-currents in the bucket area and of eddy currents downstream, both types capable of carrying heavy particles in suspension, and the configuration of the river bed downstream, all point to one general cause of the erosion, which is the scouring action on the concrete of abrasive suspended particles accentuated by high-velocity currents.

Little evidence of cavitation

The divers reported cavitation only in three small isolated areas in rows 31, 32, and 38, as evidenced by the concrete surface appearing as though the mortar had been removed from between the exposed aggregate, leaving the surface rough. It would be surprising if, after erosion by any cause, there would not be some addi-

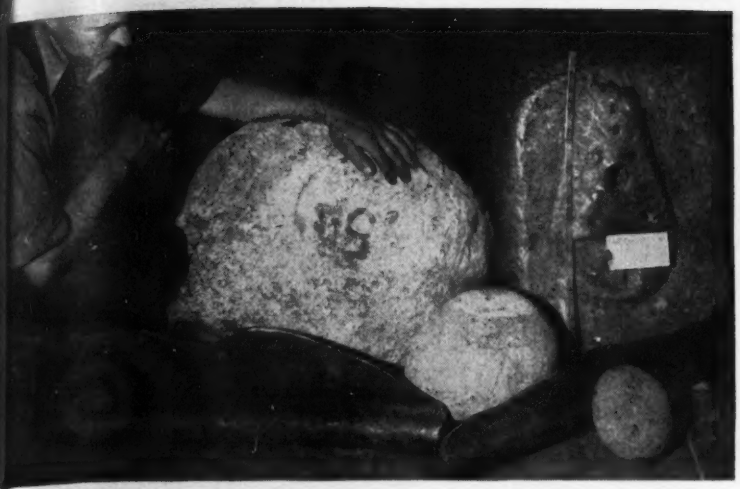


Fig. 6. Samples of material found in the spillway bucket, including pieces of steel sheetpiles and, at the right, a large block of brass.

ional erosion in the form of cavitation, resulting from discontinuity of ow by reason of previously scoured regular surfaces.

Over the vast majority of the roded areas, the divers reported the oncrete surfaces to be ground mooth and also the finding of numrous small shallow pot holes, with mooth surfaces, all indicative of abasive or grinding action. One of he largest pot holes, 5 to 6 ft. in iameter and 18-in. deep, partly filled ith rounded boulders was found in he eroded area at the 37J-38J joint. nother was in the 64J block near the ight training wall.

Conditions below the bucket

The river-bed topography downtream from the bucket suggests the ocations of the sources of the sand, ravel, and boulders that have been icked up by strong reverse currents nd carried into the bucket, there to e subjected to other swift currents, irect or cross-wise dependent on ymmetrical or unsymmetrical spillay discharges. By the channels and asins below the bucket-lip elevation f 900 and by the bars above that levation, one may picture the trend f the currents prior to the inspection nd sounding surveys. The large ar downstream from block rows 40 o 46 is especially significant in view f the deep deposit of gravel found uring the fall inspection in rows 0 to 48; as is also the relatively ight erosion in rows 31 to 34, inlusive, which are upstream from a iver-channel depression.

In appraising, for comparative purposes, the total volume of erosion that has occurred in the bucket during its $5\frac{3}{4}$ years of service, an average depth of 2 in. may be assumed throughout its length, between training walls, for a surface width from the lip of the bucket to the point of tangency with the downstream face of the dam. The resulting volume of 1,077 cu. yd. amounts to 0.8 of 1 percent of the total volume of 137,000 cu. yd. of concrete originally placed in the bucket above the foundation rock and downstream from the 0.8:1 face of the dam. Based on the above figures, including the past rate of erosion, and assuming no maintenance and that all erosion would occur downstream from the face of the dam, the bucket would not completely disappear for 715 years.

Dam not endangered

When any marked erosion occurs near the toe of a dam, particularly near one so large and important as Grand Coulee, the question naturally arises as to what extent the safety of the dam may be affected. The spillway bucket rests on the same durable granite in which the foundation of the dam was formed. The resistance of the granite to erosion by abrasion is undoubtedly as good or better than that of concrete. The cross-section of the dam is conservative and the base-width upstream from the bucket averages 400 ft. Foundation preparation before placing concrete was thorough, including not only removal of surface rock of questionable quality but excavating deeply in fissures and removing therefrom any gouge or badly broken rock. Open joints and cracks, characteristic of all massive igneous rock, were sealed by pumping cement grout under high pressure into holes drilled 200 ft. deep.

In the light of all of these conditions and circumstances, including the plans for continuing maintenance of the spillway bucket, there should be no concern whatever for the safety of Grand Coulee Dam.

In retrospect, one may wonder why the designs for Grand Coulee Dam did not provide for the hydraulic-jump type of apron to dissipate the enormous energy of the falling water, such as have been constructed at Madden, Norris, Marshall Ford, Friant, and Shasta dams. That type of design was considered but discarded in favor of the bucket type because hydraulic-model tests showed more effective dissipation of energy. Also, estimates indicated the bucket could be constructed at a much less cost. Even now, with knowledge of the erosion as revealed, the bucket is preferred to any known types of design for destroying the force of the spillway flows at the toe of Grand Coulee Dam.

The data obtained from the inspections of the bucket and from the operating conditions that aggravated the erosion are valuable as guides for maintenance operations at the dam. Also, that information, together with the forthcoming experience in operating the projected bucket-maintenance facilities, will be useful in preparing later designs and in planning for maintenance at other high overflow dams, for which there has been an almost complete lack of precedent.

Supervision of the work

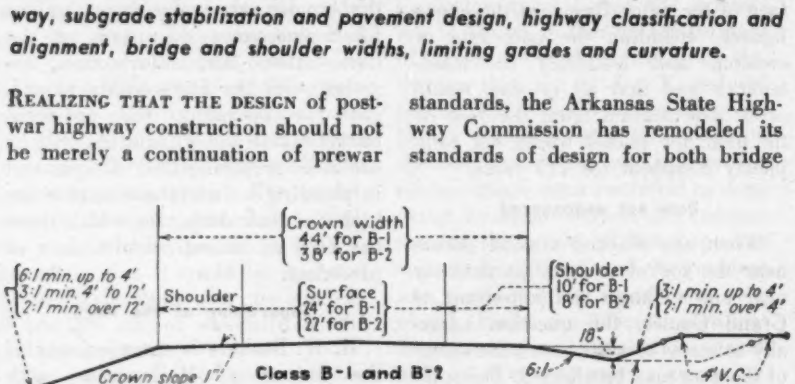
H. W. Bashore is commissioner of the Bureau of Reclamation with headquarters at Washington, D. C. Design and construction are supervised by S. O. Harper, chief engineer, Denver. J. L. Savage also located in Denver, is chief designing engineer. F. A. Banks, supervising engineer of the Columbia Basin Project, and A. F. Darland, construction engineer, both with offices at Coulee Dam, Wash., are directing the installation of maintenance equipment.

A 24-ft. concrete pavement with wide shoulders on U. S. Highway 65 approaching Little Rock from the north.

New Design Policies for Arkansas Roads

***Contents in Brief**—New policies of standard design practice are adopted by the Arkansas State Highway Commission in preparation for the imminent construction program. Major changes affect width of roadway and right-of-way, subgrade stabilization and pavement design, highway classification and alignment, bridge and shoulder widths, limiting grades and curvature.*

REALIZING THAT THE DESIGN of postwar highway construction should not be merely a continuation of prewar standards, the Arkansas State Highway Commission has remodeled its standards of design for both bridge and highway construction. An excellent opportunity was afforded the highway officials making the studies for this important phase of postwar planning by the decreased activities in highway work caused by the war.



Minimum widths of road surface, shoulders and roadway crown are specified, similar designs being used for Class B-1 and B-2 highways and for Class C, D and F roads.

The new design policies were approved by the executive staff on Feb. 9, 1944. They cover a wide range of items required in the every-day design of highways. More attention will be given in the future to the proper stabilization of subgrade, shoulder width, type and width of pavement, alignment, grade line and width of right-of-way. Roadway widths for bridges also received careful study, resulting in an improved balance between length of structure, amount of traffic, and width of roadway.

Highways are reclassified

In setting up the new design policies, 2-lane rural highways were cataloged in 5 classes based on traffic density similar to those recommended by the American Association of State Highway Officials. As shown in Table I, Class B highways are divided into two units; B-1 for 1,500 to 4,000 ve-

icles per day, and B-2 for 750 to 500. Class E has been combined ith Class D in the A.A.S.H.O. group- g, while Class F and G in that group- g have been combined as Class F vering all highways having a daily affic count below 100 vehicles.

This revised classification was nec- ssary since the A.A.S.H.O. range is o wide to fit conditions in Arkansas. ighways carrying more than 4,000 ehicles per day (Table II) will have traffic lanes. Their 6-ft. minimum idth median strip will be widened s necessary to furnish refuge at ross-overs for maximum legal length rucks or as may be most economical ue to topography.

Any 4-lane construction in the near ture probably will be on the pro- osed interregional system. Such con- truction will be in accordance with he interregional design standards as inally adopted by the cooperating gencies.

Class F design is intended to cover he increasing requirement for feeder oads of the county road type where affic justifies no more than an all- eather road. Very little of this con- truction has been completed to date. The chief purpose of the Class F de- ign factor is to build according to affic justification as well as the conomics of the geographical loca- ion of the highway improvement roject.

Anticipated traffic density

Considerable thought was given to nticipated increases in traffic den- ity throughout the life expectancy of ew sections of highway. The amount f traffic used in classifying the state's ystem of roads into the different lasses under the new design policies s based on the last normal traffic ount, made in 1940.

For each section of road being con- idered, this prewar normal count is ncreased 40 percent, with further ad- ustments being made for any un- sual conditions which might de- rease or increase future traffic.

Records disclose that highway traf- ic in Arkansas increased 30 percent uring the 10 years prior to 1940. On his basis it is expected to increase ome 40 percent in the next decade. Thus, it is believed that highways lassified on 140 percent of the 1940 ount will be designed for the average affic expected to use them through- ut their 20-year life expectancy.

Determination of the type and thickness of highway pavements will depend on several factors incident to each job. In general, however, the following pavements are favored:

Four-lane and Class B-1 Highways: An 8-in. portland-cement concrete pavement reinforced with wire mesh; or an 8-in. gravel or crushed stone base carrying a 1½-in. bituminous leveling course and a 2-in. bituminous concrete surface.

Class B-2: A mesh-reinforced 8-in. portland-cement concrete pavement; or a 6-in. gravel or crushed stone base, a 1½-in. bituminous leveling course and 2 in. of bituminous concrete surfacing (either hot or cold-laid).

TABLE I. DESIGN POLICIES FOR 2-LANE HIGHWAYS

	Federal Aid System				
Class	B-1	B-2	C	D	F
Traffic:					
Daily Average (24-hr.)	1,500–4,000	750–1,500	300–750	100–300	Under 100
Hourly Maximum	150–400	75–150	30–75	10–30	Under 10
Design Speed (m.p.h.):					
Level	70	70	60	50	40
Hilly	60	60	50	40	30
Mountainous	50	50	40	30	30
Surface Type	Pavement	Pavement or Intermediate	Intermediate	Dustless	All-Weather
Surface width (ft.)	24	22	22	20	18
*Shoulders—Min. width (ft.)	10	8	8	4	4
Type of shoulder	Sod or stabilized gravel			gravel or earth	
Crown—Min. width (ft.)	44	38	38	28	26
Right-of-way, Min. (ft.)	120	120	120	80	60
Bridge widths (ft.):					
21 to 50-ft. length	44	38	38	28	18
51 to 1,000-ft. length	28	26	26	24	18
Over 1,000-ft. length	26	24	24	22	18
Bridge loading (A.A.S.H.O.)	H-20	H-20	H-20	H-15	H-10

* A 4-ft. minimum shoulder is permitted in solid rock excavation.

TABLE II. DESIGN POLICIES FOR 4-LANE HIGHWAYS

Daily traffic (24-hr.)	Over 4,000
Design Speed:	
Level	70 m.p.h.
Hilly	60 m.p.h.
Surface type	Pavement
Surface width	2 at 24 ft.
Shoulders—Min. width	10 ft.
Median strip	6 ft. min.
Right-of-way	160 to 200 ft.
Bridge loading	H-20

Bridge width to exceed pavement width as specified for Class B-1 highways.

Class C: A 6-in. gravel or crushed stone base with a 2½-in. hot or cold-laid asphalt mat.

Class D: A 3-in. gravel or crushed stone base with a 3-in. oil mix asphalt mat.

The types of pavement, such as flexible and rigid, shown for the various classes of roads are not intended to be comparable types. Availability of local materials and other economic factors will determine the type of pavement selected.

Construction of flexible bases thinner than thicknesses comparable to rigid pavements is believed to be economically justified, considering that failure areas can be repaired. These flexible pavements also can be thickened or widened as necessary by stage construction. Stabilized bases will continue to be used where soils are satisfactory and the surface probably will be a ¾-in. double bituminous surface treatment, (inverted penetration).

Bituminous leveling course

One singular construction procedure contained in the new design policies is the use of a leveling course of bituminous materials for flexible pavement. The base thickness has been decreased 1 in. and a 1½ in. leveling course is added.

Current policy of the highway department is to compact the earthwork and sub-base materials, allow the flexible bases to set up under one season of winter traffic, apply the leveling course to restore the grade and pavement section, and then apply the top course and seal coat. This leveling course is believed to offer more stability and load carrying capacity than a like amount of stone or gravel base.

On the premise that granular subbase material provides uniform subgrade load capacity, Arkansas' concrete pavements are designed for an infinite number of repetitions of a 10,000-lb. wheel load, and it is expected that the legal 9,000-lb. wheel load limit will be enforced in the future.

TABLE III. CURVATURE, GRADE AND SIGHT DISTANCE

Design speed (m.p.h.)	70	60	50	40	30
Curvature:					
Desirable	1°–30′	2°–00′	4°–00′	6°–00′	10°–00′
Maximum	4°–00′	5°–00′	7°–00′	10°–00′	16°–00′
Grade (Max.) in percent:					
For 500-ft. or more	4	5	5	6	8
Under 500-ft. length	5	6	6	8	10
Sight distance (Non-passing):					
Desirable minimum (ft.)	1,000	900	800	600	500
Absolute minimum (ft.)	800	700	600	500	400
Sight distance (Passing):					
Usual minimum (ft.)	3,200	2,300	1,600	1,100	600
Absolute minimum (ft.)	2,900	2,100	1,400	900	500

During the past 6 years Class C, or better, highways have been built with full width bases of from 6 to 8½ in., of gravel or crushed stone. Surface courses were 20 or 22 ft. wide, using either 1½ in. of open graded bituminous road mix or 2 in. of dense graded bituminous road mix. Both types had seal coats.

Other pavements used in the past include a 23-ft. cement or bituminous stabilized base course 6-in. thick and a 22-ft. double bituminous surface treatment ¾-in. thick, if soils were satisfactory.

Still another type of pavement was a 20-ft. portland-cement concrete slab of 9-6-9 or 9-7-9 in., depending on subgrade materials. These pavements have ¾-in. expansion joints at 50-ft. intervals.

A 9-in. uniform non-reinforced concrete pavement, with expansion joints spaced 120 ft. apart and dummy joints at 20 ft., has been used during the wartime emergency. Some 24-ft. reinforced pavement had been built before the war, an example of which is to be found on the heavily traveled Highway 65 serving Camp Robinson and Little Rock. Surfacing on roads less than Class C have, in general, been 6 in. of traffic-service gravel.

Right-of-way to be wider

The question of right-of-way width has been given serious study. Widths adopted under the new design policies (Table I) are somewhat less than those recommended for the proposed interregional highway system. They are deemed adequate, however, for trunk line construction as well as for the future improvement of secondary roads as they develop.

Past practice in Arkansas has been to use an 80-ft. right-of-way, widened as necessary to accommodate special road sections or to provide for side borrow. This resulted in a multiplicity of breaks in the right-of-way and, in many instances, provided insufficient widths for reconstruction of the road section. In some cases the highway improvement enhanced the value of adjacent property and often encouraged improvements along the right-of-way which added to the difficulty of obtaining additional widths where reconstruction was proposed.

During the past six years maximum grades and curvatures were controlled by terrain, with little regard for traffic density. They were:

	Grade (Max.) percent	Curvature (Max.) degrees
Flat terrain	4.5	4 to 5
Rolling	6.0	6
Mountainous	7.0	8 to 10

Passing and non-passing sight distances (Table III) are both computed on the basis of a 4.5-ft. height for driver's eye to a 4.5-ft. high object. Non-passing sight distances are practically the same as the A.A.S.H.O. basis using a 4.5-ft. driver's eye to a 4-in. object.

Another new procedure in highway construction is the extensive use of special sub-base materials over unstable or unsatisfactory soils to insure uniform subgrade support. Chief purpose of this operation is to aerate, stabilize and supplement the thickness of flexible bases as well as to minimize pumping of rigid pavements.

Wider shoulders are specified for all roads with an anticipated traffic over 300 vehicles daily. This practice will provide ample areas for off-pavement parking on the more heavily traveled highways.

Roadway sections have been flattened and side borrow is eliminated. This adds to the safety, appearance and life of the road. Road grading contractors will appreciate these changes since practically all rough construction and finishing may be done by heavy earth-moving equipment. Old standards called for side slopes in fills of 1 on 3 or 1 on 4 for fills up to 4 ft., and 1 on 2 for higher fills.

Compaction of earthwork, used more or less experimentally in the past, is included in the new design policy. It is considered a maintenance saving feature, as are the items such as new type sub-bases, leveling courses and flatter roadway sections.

Something new in laying grade lines

Several important improvements have been made in the matter of laying grade lines. Past practice dictated that they be established largely by balancing cuts and fills. Side borrow supplied most of the additional material that was needed.

Under the new procedure the most desirable grade line is laid, necessary side drainage is provided and all borrow other than that yielded by normal cuts is obtained off the right-of-way. Grade laying also is influenced by the character and elevation of different types of soils encountered along the route.

Some distinct advantages of this improved grade-laying procedure are that it improves subgrade conditions, allows the selection of better soils, increases the efficiency of roadway drainage by keeping flow lines as high as possible and frequently eliminates the requirement for long lateral outlet ditches that are so difficult to maintain.

Railroad grade crossings

Comprehensive studies are being made of railroad grade crossings to determine whether they require grade separations or merely flasher-type signal protection. The degree of necessity for improvement is based on a hazard formula.

Many items enter into this formula. They include: accident history; density, character and speed of both highway and rail traffic; number of railroad tracks; the total time per day the crossing is blocked by switching operations; grades, amount of glare and length of sight distance.

Maximum highway traffic, maximum rail traffic and extremely hazardous local conditions each count 5 points. A total rating of 9 points calls for the installation of a flashing signal, and a rating of 25 or more signifies the necessity for a grade separation.

The practice of designing bridges of 50 ft. or less in length to full roadway shoulder width is a new depar-

ture for Arkansas. It was adopted as a safety design feature. Whether bridges on 4-lane divided highways will be built as one bridge or as two separate structures will depend on the width of the median strip on the approaches. In all cases, however, they will exceed the approach pavement width by the amounts shown in Table I for Class B-1 highways.

More attention is to be given to the construction of proper roadway crown for asphalt surfaces. Crown slopes are increased to ¼-in. per foot and road shoulders are to be sloped 1 in. per foot to facilitate quick and positive surface drainage.

Short course for field men

The Arkansas State Highway Commission has formulated a plan for more uniformity of engineering practice for all of its highway and bridge construction. In addition to the adoption of these standard design practices, a short course of intensive instruction will be given yearly to all resident engineers, instrumentmen and inspectors.

Meeting in convenient groups at Little Rock, these men will study laboratory procedure with emphasis being placed on soils. Other subjects will include: a uniform method of keeping notes and records; the proper interpretation of specifications; a review of the fundamentals of the road and structure design; and standardization of field practice and inspection of materials.

Anticipate many benefits

Benefits to be derived by the Arkansas Highway Department through the complete overhauling of its design policies will be both immediate and of lasting significance. Maintenance costs will be reduced and the appearance of highways will be improved. Highways and bridges will be more durable and designed to serve better both present and future requirements. Uniformity of design and construction procedures will promote better relations between highway department and contractors, with the probable reflection in lower contract costs.

Who made the studies

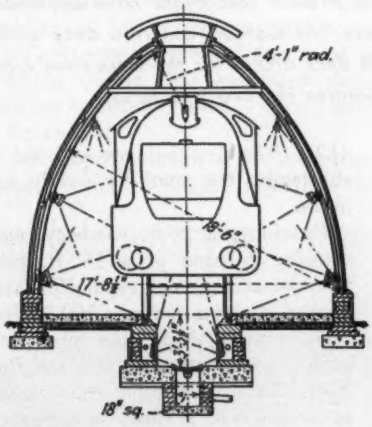
Preparatory studies necessary to the adoption of these standards were made by a committee from the Highway Department's engineering staff composed of Geo. L. Fry, engineer of highway design; F. J. Herring, engineer of statistics and analysis; E. L. Wales, engineer of materials and tests; A. E. Johnson, assistant to the chief engineer; and N. B. Garver, bridge engineer. Chairman W. W. Mitchell is director and chief engineer, and V. E. Scott is assistant director, of the highway department.

Blackout Tunnel Designed For Locomotive Inspection

Heavy wartime traffic together with a shortage of railroad locomotives in England requires that the most diligent care be exercised to keep this equipment in perfect running condition. Frequent night inspection thus becomes a major problem. Thorough inspection under normal conditions has never been an easy matter, and now with blackout conditions prevailing the problem has become even more difficult.

The design for a blackout inspection tunnel, described in a recent issue of *Engineering*, a British journal, is of interest although the need for such a structure in the United States has passed—if the need ever existed.

The tunnel is in reality a hut or shed, 80 ft. in length, with double doors at each end and a single line of track running through it. Each of the main doors is provided with a wicket door having a light lock to permit the ingress and egress at night time of engine crews, depot staff and others. Switches connected with the main doors automatically turn off the floodlighting should these doors be opened. There remains a small amount of light provided by the industrial type reflector units seen above the floodlights in the accompaning drawing.



Tunnel-shaped shed built in England for night inspection of locomotives under blackout conditions.

Though expected to prove useful under peace-time conditions, and to be a pattern for similar structures elsewhere, the tunnel has been described as a wartime measure of a temporary rather than a permanent character.

From the accompanying cross section sketch it will be seen that there is ample room to pass down each side of a large locomotive of modern type; a pit is provided underneath. The width of the tunnel between the two 13½-in. brick walls supporting it is 17 ft. 8½ in.; the floor of the pit is 3 ft. 3½ in. below the tops of the rails, which are flush with the tunnel floor. The latter is a bed of concrete, 6 in. thick, resting on 4 in. of hardcore. The concrete supporting the pit walls is 1 ft. 2 in. thick. Ventilation near ground level is provided by 9 x 6-in. air-brick blackout ventilators set at intervals of 10 ft. in the supporting walls.

The tunnel crown units are provided with openings for the escape of smoke. A smoke-collecting hood or chute, which serves also as a glare shield, runs the length of the tunnel; this is made of corrugated asbestos-cement sheeting. To keep out rain, and provide a further safeguard against the escape of light, the roof opening has mounted a short distance above it a cover, also made from corrugated asbestos-cement sheeting, curved to a radius of 5 ft. 6 in.

Practically shadowless lighting is obtained by the use of tubular mercury discharge lamps in conjunction with a white finish for the interior surfaces of the tunnel and the pit; the latter is faced with white glazed bricks. The lamps are of the fluorescent type which give light that is corrected to some extent for the deficiency of red in the mercury spectrum. Special alcoves surfaced with a high-gloss white paint are provided to house the pit lighting units.

Fig. 1. Ribs for the downstream bridge were built first, then forms were shifted for construction of the second crossing.

Use of Twin Bridges Simplifies Design

***Contents in Brief**—On a dual-lane express highway, twin bridges of identical layout are being built to permit the two roadways to act independently, thus avoiding the uncertain stresses that might have developed in the wide deck of a single structure. Reinforced concrete deck girder spans are used for the approaches and deck arches for the main river crossings. A 6-ft. raised median strip separates the two structures.*

TWIN BRIDGES now under construction to carry a dual highway over the Big Piney River in southern Missouri represents the first instance in which a layout of this particular type has been used in that state. Two crossings were decided upon to provide articulation between the dual-lane roadways, which was considered important from the stress standpoint. If a single bridge with a wide deck built monolithically had been constructed, uncertain stresses in the structure might readily have been set up because of unequal changes in the long arch ribs due to loading, shrinkage, temperature and other factors. The measures taken to assure structures of esthetic appeal give the project added interest.

The job is located about 20 miles west of the city of Rolla on Route 66, which is being improved to provide a four-lane divided highway for several miles in the vicinity of Fort Leonard Wood (*ENR* Sept. 24, 1942, p. 412). The new bridges will aid in shortening the road by nearly two miles.

Providing a 26-ft. roadway, each crossing consists of a 160-ft. reinforced-concrete, open-spandrel arch flanked at either end by a 100-ft. deck arch, plus a 45-ft. concrete deck-girder span at the west end and four 50-ft. spans of similar construction at the east end. A raised median strip of 6 ft. overall width separates the two structures.

Before this design was adopted, several different types of crossings were considered. General site conditions dictated that a central span of about 160 ft. be provided, the site being particularly favorable to deck construction. If a concrete structure was to be built, reinforced arch spans were to be used for the main crossing, as other types of concrete construction were not suited to spans of this length.

Deck plate girders of steel were equally adaptable to the location, and comparative cost estimates were made for this type of main crossing, plus I-beam approaches. These studies showed that the reinforced-concrete arch and reinforced-concrete girder design was 20 percent more economical than the alternate steel design. This type of construction also was believed to permit better architectural treatment and is expected to have lower maintenance costs.

In making the final layout, for appearance, the side arch spans were made shorter than the 160-ft. central span. The symmetry of the structure was further improved by curving the bottom flange of the girders of the approach spans.

The final design was made for an H-20 loading in accordance with specifications of the American Association of State Highway Officials, an 18,000-psi. maximum stress for the reinforcing steel and a 900-psi. stress for the concrete being used. Concrete with a minimum compressive strength of 3,000 psi. was specified throughout.

For each bridge two lines of arches are used in the main spans and three lines of girders in the approach spans. The 160-ft. arch ribs are 6 ft. wide and vary in depth from 4 ft. 9 in. at

the haunches to 2 ft. 6 in. at the crown, the maximum rise being 25 ft. 9 in. The spandrel columns in this span are 4 ft. by 18 in. in cross section. The floorbeams are 2 ft. 8 in. deep and 12 in. wide, and the deck of 11½-in. uniform thickness.

To accommodate the 1.3 percent longitudinal grade of the structure, the rise of the east 100-ft. arch was made 24 ft. 9 in. and that of the west arch 28 ft. 4¾ in. The ribs of the 100-ft. spans also are 6 ft. wide, varying in depth from 3 ft. to 1 ft. 8 in. The cross section of the columns and beams and the thickness of the floorbeams in the 100-ft. spans is the same as that of the central arch.

The four approach girder spans at the east end were designed as two continuous two-span units. The girders were all made 21 in. wide. Measured below the 8-in. deck, they varied in depth from 4 ft. 1 in. at the center of the spans to about 7 ft. over the open bents.

Fig. 2. Two bridges are identical, two lines of ribs being used for the arch spans of each structure. Foundations for the two crossings, which are carried to rock, are completely independent.

Construction proves difficult

Construction to date has proven difficult. The piers and abutments are carried on rock of good bearing quality, being built in open sheetpile cofferdams. Work on the foundations was well advanced when highwater flooded the cofferdams, washed away a large pile of coarse aggregate, and caused a serious delay. Furthermore, much work had to be done during winter weather, which required that materials for much of the concrete be heated and that concrete in place be protected against temperatures as low as five below zero. The shortage of reinforcing steel also made progress slow, as did the severe shortage of local labor, the job being shut down for several weeks last winter because of this difficulty.

The four girder spans at the east end were completed first, then the arch spans from east to west were built, and finally the west girder approach span. Plywood forms of a sturdy design that permitted their re-use several times were used throughout.

To support the forms for the girder spans a row of 10-in. butt diameter timber piles, cut nearby, were driven on about 8-ft. centers for each of the three lines of girders. Above these piles 12 x 12-in. timbers were used. In constructing the deck on these spans, expansion joints were provided at about 40-ft. centers. The decks have no crowns, being sloped uniformly to carry all water away from the median island.

The construction procedure followed in building the arch spans was to build the east arch, then the center, and finally the west span. In each case the two ribs for the south structure were constructed before the ribs for the north bridge, the same forms

Fig. 3. Bottom flange of the girder approach spans is curved to improve the appearance of the finished crossings.

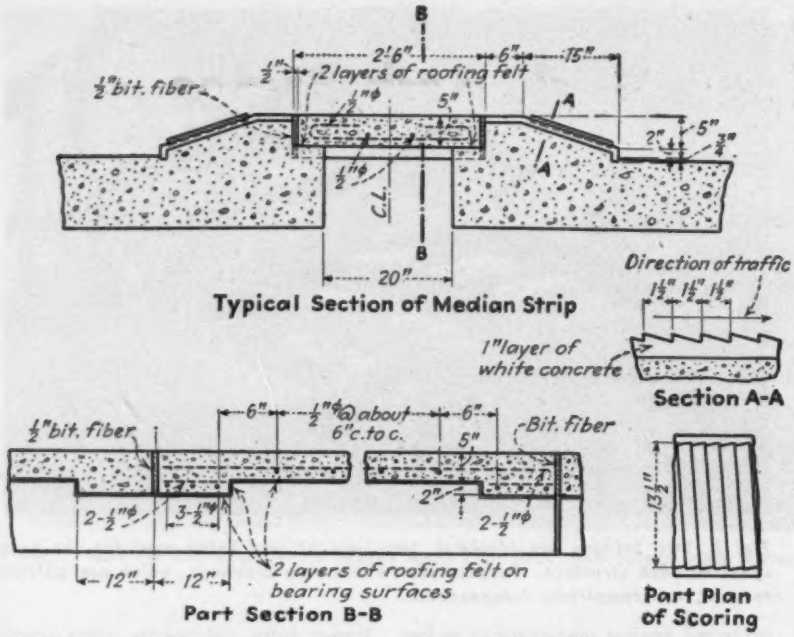


Fig. 4. Original plan was to use steel grating for raised median strip, but when this material became critical a reinforced slab was substituted. Top 1 in. of the shoulders of the island was made with white cement concrete, scored as shown in Section A-A to form light reflecting faces.

being used to construct the ribs of the north crossing.

Long ribs built in seven sections

The longer ribs were built in seven sections, exclusive of keys. The crown section was poured first, next the sections immediately above the spring lines, and finally the two intermediate sections at either side. On the 100-ft. ribs five sections exclusive of keys were used. That at the crown was constructed first, followed by the sections at the spring lines, and finally the closing blocks. General procedure was to delay 24 hr. before placing the key section for a given rib. This delay permitted the initial shrinkage of the concrete to occur.

Forms for the arch ribs were supported on falsework made in four-pile bents—two piles under each rib—on about 10-ft. centers. The 10-in. dia. piles used were driven to rock.

In moving the forms over for the north bridge, the forms and the falsework above the spring line of the arches were shifted on rollers as a unit, a crawler crane providing the motive power. This operation, once preparations were complete, took about 2 hr. at each arch and was much quicker than if the forms and falsework had been moved in sections.

Once the work of placing the concrete for the deck of a given arch span was started the roadway was poured from pier to pier in one continuous operation, requiring some of the largest continuous pours needed in building the two bridges. Joints were added to divide the floor into sections 35 ft. long. These joints make the deck of the arch act as a series of three-span continuous slabs over the floorbeams, which are on about a 12-ft. spacing.

Median island has scored curb

The original plan was to close the gap between the bridges with an open steel grating. When war conditions made this material difficult to obtain, a reinforced slab placed in 20-ft. lengths was decided upon. Details of the island are illustrated in Fig. 4, which also shows the method of scoring the shoulders along the median strip and the use of white concrete to improve visibility of the island at night.

Concrete for the construction to date has been prepared by portable mixers, a 3-bag unit and a 2-bag mixer, moved about as the job required. It was delivered with a ½-in. to 1½-in. slump, being placed by a bottom-dump bucket handled by a crawler crane working from one side. An exception was delivery by rubber-tired buggies in constructing the deck. All the concrete, which has developed at 28 days a compressive strength much greater than 3,000 psi., is vibrated in place.

The work is being done by the Missouri State Highway Department, C. W. Brown, chief engineer, V. W. Enslow, bridge engineer, J. L. Pasley, chief draftsman, and Chester Crawford, project engineer. The twin bridges, among the most beautiful structures in Missouri, will cost about $300,000.

The Hannibal Contracting Co., Hannibal, Mo., represented on the job by J. M. Joyce, is the general contractor, and C. E. Maxwell & Sons, Columbus, Kans., with C. E. Maxwell, Jr., superintendent, is subcontractor for much of the work.

New Sign System Planned For Michigan Highways

One of the first highway improvements scheduled for installation in Michigan when the war ends is a new system of highway signs, designed to reduce driving hazards and expedite traffic control in industrial areas, according to Charles M. Ziegler, state highway commissioner.

Branding the present system antiquated and containing many omissions and discrepancies, Mr. Ziegler requested the Public Roads Administration for $20,000 of the state's unexpended balance of federal-aid funds to be used in a statewide inventory and survey, and got it. The federal grant will be matched by $20,000 in state money.

Cost $1,000,000

In an unofficial estimate, highway engineers set the re-signing cost at nearly $1,000,000. The department estimates that 75 percent of intersections are inadequately signed, that 90 percent require town, name, distance, route confirmation and direction signs; that 25 percent of the caution, warning stop and speed signs are not reflectorized, and that thousands of additional signs are not standardized and need improvement in mounting.

An estimated 15,000 stop signs are required at danger points, and scores of speed control zones are not marked. Only 30 percent of painted "no passing" zones are properly signed, said Commissioner Ziegler.

Reinforcing a Brick Arch Bridge Under Railroad Traffic

R. D. McGilvra
Chief Engineer, Brann & Stuart Co., Philadelphia, Pa.

TRAVELING ARCH FORMS and a typical tunnel concrete set-up were used in reinforcing a brick masonry arch bridge on the New York Division of the Pennsylvania Railroad's main line, without interferring with high speed traffic.

The five barrel arches, over Poquessing Creek near Torresdale, Pa., were built in 1886 to carry three tracks and were widened in 1911 for a fourth track. The ability of the brick arches to support modern loads and high speed trains can be considered a tribute to the methods and materials of construction used over fifty years ago but the brick work recently showed enough signs of deterioration to warrant strengthening.

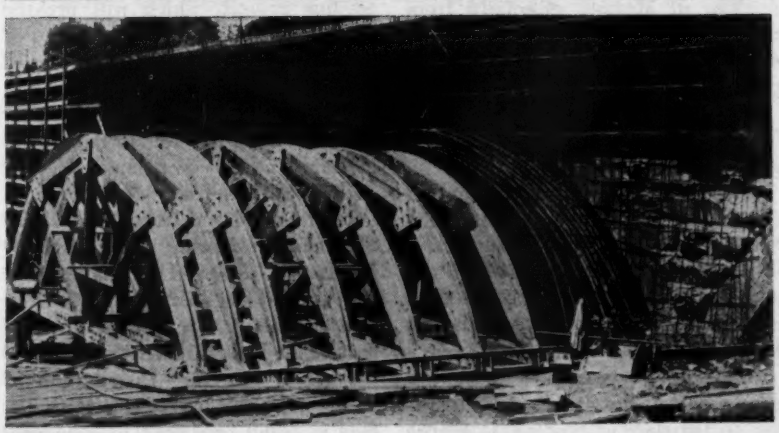
Only the three center arches of the bridge are necessary as waterways and these have an area sufficiently large that concrete lining, 18-in. thick at the crown, could be placed inside the barrel to reinforce the original brick arches. The new barrel section is supported on pier additions, carried to rock and encasing the original stone masonry piers with 2 ft. 2 in. of concrete. One end arch was filled with earth and the other end arch is to be replaced with a beam structure that will provide greater clearance and a longer span over an adjacent street.

The contractor elected to do all the work on reinforcing the bridge from underneath so that no interference with railroad operations was necessary. All reinforcing steel for the arch was tied to expansion bolts placed in the brick ring in advance of forming for the concrete placing.

Rolling forms, one for each barrel arch, were built outside the bridge on temporary timber bents. The bottom chord of the trussed arch was high enough to clear debris carried by the stream during its frequent flash floods. After joists and sheeting were placed, the form was moved under the arch on pipe rollers and jacked to elevation. A 16-ft. width of barrel was poured at each setup, the form being reused four times for the 65-ft. width of arch.

Concrete was delivered in trucks from a central mixing plant to the remixer of a large, single-action concrete pump, which remained in one location for the entire job. The concrete pipe was carried, on blocking and scaffold, about 200 ft. to the arch where two 45-deg. bends in the pipeline were used to raise the concrete to the level between the two layers of arch reinforcing. Inside the form a straight 15-ft. section of regular pumpline pipe was used, fabricated from two pieces by welding and having a coupling only at the end kept outside the form. Short sections of pipe outside facilitated withdrawal of the pipe from the form as the concrete filled the interior.

At the start of each pour there was enough room inside the form for two



This 60-yr. old brick arch and stone masonry bridge (above) on the Pennsylvania Railroad was reinforced under traffic. Concrete was pumped to position over a traveling tunnel-type form to make the practically new structure.

Old masonry bridge, with concrete encasement, is ready for another sixty years service under the Pennsylvania R. R. main line.

men to puddle concrete and operate vibrators until the concrete approached the crown section. In placing concrete in the crown, the pipe was left buried in the concrete and the surge and boiling of the concrete provided vibration.

An air connection was welded to the pipe near the 45-deg. bend and a throttle valve installed so that the concrete pump could be assisted with short surges of compressed air, on the stroke of the pump, to pack the concrete tight against the old brick arch.

Grout used to fill voids

Two or three days after each pour two holes were drilled through the concrete arch. Then the small opening between the brick and the new concrete, caused by shrinkage and by vibration from the railroad traffic, was pressure-grouted with neat cement. Each form was left in place ten days, then lowered and rolled ahead. With three rolling forms in operation it was possible to make one pour every three days.

All work was under the supervision of Charles E. Adams, chief engineer of the New York Zone, Pennsylvania Railroad; T. W. Pinard, engineer of bridges and buildings; and M. L. Kyle, assistant engineer.

Contractor for the improvement was Brann & Stuart Company of Philadelphia.

Mexico Reports on Irrigation Program

A Mexican National Irrigation Commission report on two years of intensive development of reclamation projects reveals over 210,000 acres have been reclaimed at a cost of about $25,000,000. Work on a large number of projects has continued despite difficulties in obtaining priorities for construction equipment and machinery to go into the dams. Shipping difficulties in Mexico, especially from the extreme south to the northern deserts, has also created many severe problems.

A summary of progress as released by the commission for different regions is as follows:

Chihuahua—Work has begun in Chihuahua state on the Delicias district project, and the Ciudad Juarez irrigation district has started an expansion program. Las Virgenes Dam is being constructed to provide water for an important area.

Sinaloa—Work on the Tlacuache dike, a part of the Sanalona Dam system in the state of Sinaloa, is nearly complete. Diversion channels are being constructed.

The Lerma River—Work along this stream, which drains parts of the states of Jalisco and Michoacán, has been speeded up. A diversion dam is now being constructed at Lomo del Toro.

Colorado River—Canals and laterals are being built to distribute water from this river in the northern district of Lower California.

El Palmito Dam—Work continues on this project, which will provide water for a large area in the states of Coahuila and Durango. It is one of Mexico's most important irrigation districts. The outlet works at the dam for controlling the flow to the system of canals have been completed.

Ixmiquilpan—The Mayo Dam is being repaired and lateral and drainage canals are being constructed.

Texcoco Lake—The commission has applied for permission to construct canals in this section, which is part of the federal district.

State of Morelia—Distribution of water in the Morelia-Querétaro district is being expedited by construction of a series of canals and laterals in the valleys of Undaneo, Morelia, San Bartolo and Querédaro.

Tierra Caliente—This project is another irrigation district in the state of Michoacán. A dam has been constructed at Amezcua; dams are being repaired at Santa Anna and Buenavista, and the San Antonio canal has been cleaned.

Nuevo Leon—A diversion dam has been constructed in the Las Lajas irrigation district in the state of Nuevo Leon, and a principal canal is being built.

Valsequillo—This project calls for construction of the most important dam in the state of Pueblo, work on the diversion tunnel having been completed. The required tunnels and canals to distribute the water are being constructed. One of the tunnels, that named El Mirador, will be six miles long.

San Juan del Rio—A new dam at San Ildefonso in an irrigation district in the state of Querétaro, has been completed and the principal canal soon will be opened.

El Conejo Dam—A road has been built connecting this project on the Bravo River in the state of Tamaulipas with the Mexico-Laredo Highway. The principal canal of Xicoténcatl has been completed and other canals and laterals are being built.

Use of Air-Entraining Agents In Concrete

Editor's Note — Papers presented at the recent annual meeting of the American Society for Testing Materials included two dealing with air-entraining agents in concrete. Because of the extensive interest in this subject, the two papers, briefly mentioned in last week's news account of the meeting, are printed below in abstract form.

OBSERVATIONS ON USE OF VINSOL RESIN

Of 52 CEMENTS studied in 1939 for durability by the Central Concrete Laboratory of the Office of the Chief of Engineers, six exhibited outstandingly superior durability and all six were found to contain air-entraining agents. This discovery led, in 1941, to the specifying of Vinsol resin treated portland cement for use on certain projects constructed by the Corps of Engineers. Up to the present time this laboratory has tested in excess of 1,800,000 bbl. of Vinsol resin cement for use in military construction. In general, this material has been found to be satisfactory and its use has resulted in concrete of superior durability. In a few instances, however, cements conforming to the specifications have entrained excessive amounts of air in concrete.

Evidence from field construction indicated that the air content of concrete made with portland cement containing Vinsol resin was not closely predictable from the amount of Vinsol resin present in the cement. In order to determine means by which the air entrainment could be made regulable to a reasonably degree, it was necessary first to learn the nature of the reaction between Vinsol resin and portland cement. The results of this investigation are presented.

The 106 cements included in the first phase of this study, representing the product of 19 mills, contained flake Vinsol resin interground at the mill. Chemical analysis revealed a range of 0.019 to 0.069 percent Vinsol resin by weight of the cement.

Mortars used for tests

Since it was found that above two- and one-half times more air was entrained by Vinsol resin treated cement in mortar than in concrete, it was decided to use mortars for these tests. Standard mortars were prepared and a mixing time of 4 min. was used. The air content was computed from the reduction in volume when a known volume of mortar was subjected to a pressure of 20 mm. of mercury. Alkalinity, Vinsol resin in solution, and alkali in solution were determined chemically on an aqueous extract, which was obtained by filtering a portion of the mortar under reduced pressure.

Lack of correlation shown

The relations of the data developed by these tests showed that there was no direct correlation between the air content of the mortars and the Vinsol resin content of the cements. On the other hand, a fairly well-defined, linear relationship was found to exist between the air content of the mortar and the Vinsol resin content of the extract.

The absence of correlation between either alkalinity or alkali content of the contract and either Vinsol resin content of the extract or the air content of the mortar was also noted.

On the basis of the determined alkali contents of the extracts from the 106 cements, it was calculated that 0.0265 to 1.0350 percent alkali (calculated as NaOH) by weight of cement was present in solution. A cement containing Vinsol resin in the amount of 0.045 percent by weight of the cement would require only 0.0032 percent NaOH by weight of the cement to neutralize completely the Vinsol resin.

Consequently, in every case, more than eight times as much alkali (NaOH) was present in the extract as was needed to neutralize all the Vinsol resin in the cement. Since only a portion of the Vinsol resin in the cement appeared in the extract, some factor was considered to have inhibited the solution of the rest of the Vinsol resin. A combination of effects such as: Rate of neutralization, precipitation of insoluable resin salts, and absorption of resin by the cement during grinding, could be responsible for this partial inhibition.

The indication that the variation of air content was caused by the variable amount of Vinsol resin going into solution, suggested an investigation of the possibility of adding neutralized Vinsol resin to the cement. Accordingly mortars were made with nine untreated cements, in the preparation of which amounts of the sodium salt of Vinsol resin, equivalent to 0.01 percent Vinsol resin by weight of the cement, were added to the mixing water. Tests of air content similar to those described above were conducted on these mortars and on mortars made from the same cements to which no resinate was added.

Data from these tests indicated that: (1) The use of neutralized Vinsol resin affords definite advantages over unneutralized flake Vinsol resin in the control of air entrainment. (2) The air contents of mortars made with cements containing neutralized Vinsol resin develop as much uniformity as air contents of mortars made from the same cements to which no Vinsol resin was added.

Neutralized resin is better

There is some evidence to support the belief that the particle-size distribution of the cement influences the air entrainment and, since this property might vary from grind to grind as well as from mill to mill, some lack of certainty in the air entrainment probably is inevitable. It is, therefore, not possible to obtain absolute control of the air content simply by means of a quantitative control of the air-entraining agent. Nevertheless, if, as indicated by the data obtained, the variability of air content can be reduced by the use of neutralized Vinsol

resin to about one quarter of that when unneutralized Vinsol resin is used, the neutralized resin is seen to have distinct advantages.

On the basis of the promising results of the tests described above, an investigation of the behavior of neutralized Vinsol resin as an interground addition was begun. At each of five mills, single clinker burns were ground to prepare large samples (10 to 15 bbl.) of cement containing: no Vinsol resin, 0.03 percent unneutralized Vinsol resin, and various amounts of neutralized Vinsol resin (sodium resinate). Mortars were prepared from these cements and chemical and physical tests were conducted in the manner previously described. As in the case of the 106 cements originally tested, no correlation was found between the air content of the mortars and the Vinsol resin content of the cements to which unneutralized flake Vinsol resin had been added.

Results substantiate past results

However, the relationship of the air content of the mortars to the Vinsol resin content was nearly linear for those cements to which neutralized Vinsol resin (sodium resinate) had been added, and the air contents of mortars containing similar amounts of interground neutralized Vinsol resin agreed as closely as the air contents of mortars made with cements containing no Vinsol resin. This substantiates the similar indication found in the earlier tests using neutralized Vinsol resin as an addition to the mixing water. It was noted further that a fairly good correlation exists between the amount of Vinsol resin in the extracts and the amount in those cements to which the resinate was added.

Graphs constructed to show the relationship existing between the air entrained in mortar and that entrained in concrete made with two types of coarse aggregate illustrated that: (1) a reasonably close relationship exists between the air entrained in the test mortar and that entrained in concrete, and (2) the variation in air content is materially less in concrete than in the test mortar. CHARLES E. WUERPEL *and* ALBERT WEINER, *engineer-in-charge and assistant engineer, respectively, Central Concrete Laboratory, U. S. Engineers, Mount Vernon, New York.*

OTHER LABORATORY INVESTIGATIONS

Under laboratory conditions, the Dewey & Almy Chemical Co., Cambridge, Mass., investigated the portland cement and aggregate constituents of concrete, especially as to differences in particle size in the presence of two classes of air-entraining agents, namely, (1) resinous materials and (2) water soluble wetting agents such as sulfated alcohols and sulfonated hydrocarbons. A Rex drum-type half-sack mixer operating at a speed of 18 rpm., was used for this investigation. A concrete mix of 1:2.5:3.5 proportions and a corresponding simulated concrete omitting the cement, were made for the purpose of comparing appearances. The sand and gravel were both bank run material, the sand having a fineness modulus of 2.62 and the gravel 7.05. The maximum size aggregate was 1½ in.

For the actual concrete mix, type I cement with a surface area of 1,750 was used. A water-cement ratio of 0.60 by weight and a mixing period of 2 min. produced a slump of 6 in. without air-entraining agents.

For the corresponding simulated mix, the same amount of sand and gravel were added to the mixer but the cement was omitted. The mixer was started and sufficient water added to produce a surface damp condition, hence a very harsh crumbly mix. Without air-entraining agents, a 2-min. mixing produced no slump.

The mixer was again started. The air-entraining agent was then added in solution form in an amount of 0.005 percent by weight of the total aggregate. This is equivalent to the amount of air-entraining agent available in a 1:6 concrete mix, assuming 0.03 percent of the agent on the cement.

For 2 min. after adding the agent, the mix continued harsh but during the next 2 min., the mix developed a flowing consistency. No segregation was apparent. The larger aggregates were covered with a paste of air and sand. The mix produced a slump of 6 in. The measured added air content was 10 percent.

The above simulated concrete mix was repeated except that a pinch of dry carbon black was added to the mix simply to impart a cement-like color. After mixing for the same period, the mix produced a slump of 6 in. and an added air content of 10 percent.

From the limited scope of this investigation, it is indicated that all the air entrained in concrete is not beneficial. It has been shown that the air which is entrained in the cement constituent does not contribute to durability. Since concretes containing entrained air will give greater durability as measured by freezing and thawing and since the air entrained in the portland cement constituent does not contribute to this durability, it is apparent that the air entrained in the fine aggregate must be responsible for the enhanced properties of the concrete. This seems to answer in part at least, why air-entraining agents may be more efficient in lean mixes than in rich ones.

The presence of well-distributed air bubbles which are introduced by the air-entraining agent on the fine aggregate provides an explanation for the mechanics of improved plasticity. For a given percentage of air-entraining agent, and constant mixing conditions, the quantity of air entrained by the aggregate is a function of the particle size of the aggregate, the optimum range being between the No. 30 and No. 100 sieve sizes. A small amount of air is entrained by fractions smaller than No. 100 sieve. If the air which is known to be present in the sand passing a No. 100 sieve is not present as free air bubbles, it is suggested that such air may be absorbed on the fine aggregate thus contributing in no way to plasticity or durability.

Too much air possible

Although air entrained in concrete is unquestionably beneficial, it seems advisable to limit the amount of such air. Excessive amount of air will permit large reductions in the water-cement ratio, yet the net reduction in strength may be too great. Furthermore, excessive air produces excessive plasticity and there is a real danger that the inexperienced user of air-entraining concrete may inadvertently reduce the cement content to an undesirable point because of the excellent appearing concrete. HENRY L. KENNEDY, *manager of cement division, Dewey and Almy Chemical Co., Cambridge, Mass.*

FREE ENTERPRISE

The Obligation of Management and Labor to Cooperate... in War... in Peace

The Invasion is on! We have unleashed our full might military victory. We have confidence that our great ength will bring success. We are strong because we e achieved unity in mobilization and in combat.

Though victory appears assured, we cannot rest until have done everything in our power to speed the day en death and destruction are halted.

The home front is an important factor in this time ment, for the fighting power of our Armed Forces ends upon their weapons. Napoleon's army fought its stomach"—man against man. Eisenhower's men t on their tonnage—tanks, artillery, machine guns, vy bombers.

As never before in the long succession of wars, the ends of heroic deeds on the battlefronts in this world nflict will be paralleled in history by the great accomshments on the production fronts. Along with these roic achievements of our Armed Forces, the world will g remember the record of our production accomplishents which have made us the stongest military power the world, as well as the arsenal of democracy.

As the conflict reaches its climax, as battles grow rcer and more destructive, our responsibility becomes ater and more critical. We must coordinate our proctive efforts with the same ingenuity and the same cision with which our Armed Forces have coordited theirs. We dare not waste the productivity of a gle man or machine in these critical days.

As our landing craft are discharging our fighting men the beaches of Europe and the Pacific, they must not nt for equipment. No interference with war produc- n for any reason can be justified. There must be no cket lines in America!

The landing of American troops in France virtually s stopped all strikes in the United States. This is imrtant and encouraging news because the prelude to vasion, unfortunately, has been an epidemic of strikes. ime lost through strikes, during the first four months 1944, was double that lost during the same period st year. April saw more strikes than any other month nce Pearl Harbor, and in May the record again was oken. Here is what happened within two weeks in May:

> Nine thousand men in six Chrysler plants in Detroit were out when a jurisdictional dispute in a "soda pop" war between the American Federation of Labor teamsters and the Congress of Industrial Organizations fired their discontent.
>
> A three-day sit-down strike occurred among 950 employees in the B. H. Aircraft plant over the refusal of the company to discharge a superintendent unsatisfactory to the union.
>
> Thirteen hundred men in the Chevrolet transmission and axle plant at Saginaw struck over a no-smoking rule and a change in shift-starting time.
>
> Two thousand employees at the Browne and Sharpe Manufacturing Company walked out when a woman was hired to fill a job long held by a man.
>
> Production of penicillin, blood plasma, and other medical supplies was halted at two Detroit plants of the Parke Davis Company as 1900 employees struck for a ten-cent raise.
>
> Over 25,000 lumber workers in the Pacific Northwest struck because the War Labor Board denied their demand for a wage increase.

At the end of the third week of May, 70,000 workers in 26 plants in Detroit were idle because of strikes.

Strikes in Detroit alone reduced production as much as a moderately successful German air raid would have done. Far more important than their effect on output is the effect of strikes upon national unity and morale. To our home front and to our Armed Forces, strikes belie our pledge to back the attack with all the power at our command. Hence, strikes limit our all-out war effort.

Prompt and decisive action is needed to keep America free from strikes for the remainder of the war. Stoppages of work on the production lines cannot be condoned while lives are being lost in fighting the enemy.

Most union leaders realize this need and are preparing to impose discipline upon their members who violate the no-strike pledge. The Warehouse Division of the International Longshoremen's and Warehousemen's Union (C.I.O.) recently declared: "Strikes in this time of war are treason against the nation and betrayal of the interests of labor." A message sent by William Green to all heads of American Federation of Labor unions stated:

> "D-day is here. From now on until Hitler is finally crushed, every worker enrolled in the army of production must consider himself a part of the invasion forces of the United States and conduct himself accordingly. I call on you in the name of the American boys who are risking their lives under enemy fire to maintain uninterrupted production under any and all circumstances. Until victory is won every worker must give the same all-out service that our Armed Forces are giving on the field of battle."

Strongest of all was the appeal of R. J. Thomas, president of the United Automobile Workers, to members of his union:

> "Our union cannot survive if the nation and our soldiers believe that we are obstructing the war effort . . . there can be no such thing as legitimate picket lines . . . I appeal to our membership. If you value your union, if you want to live and serve after the war, we must restrain ourselves and our hot-headed brothers today. If we do not, there will be no union after the war."

Union officers are entitled to vigorous support from management and government in their efforts to prevent strikes. Behind many a strike is an accumulation of unsettled grievances. Managements are overworked, and many union shop stewards are new and inexperienced and do not always do their part in turning down cases which lack merit. Both of these conditions make it easy for large backlogs of unsettled grievances to pile up. A special drive to clean up unsettled cases and to prevent new accumulations of them is one way by which managements and local union officials can help shorten the war.

The government too has a contribution to make to the prevention of strikes—both through the prompt disposal of disputes and through firm action against the leaders of strikes. The National War Labor Board and the Regional Boards are disposing of over five thousand cases a month and have made an excellent record in reducing their backlogs. Nevertheless, the boards still have many old cases; and about one out of four strikes has been an effort to get action from one of the labor boards. The boards are entitled to cooperation from employers and unions in keeping down their docket. In instance after instance, cases are dumped in the lap of the board before the union and employer have made a real effort to get a meeting of minds and to work out settlements.

In the present emergency, strikes are an expression of the lack of adequate understanding and team work between unions and management. Any future great upsurge in industrial strife likewise will be due to misunderstanding. After this war this country must not go through another "1919" when the time lost from strikes reached an all-time high. With 13 million workers, or almost half of the non-salaried employees of the country, in trade unions, the power and prestige of unions is greater than ever. ***The long-run prosperity of the country requires that business and labor learn how to cooperate in supporting the policies which produce the largest possible profits and the largest possible payrolls.***

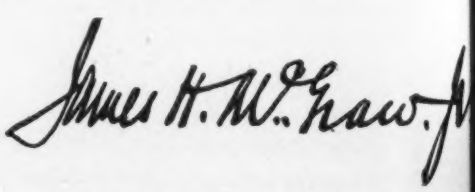
Although business is primarily interested in the largest possible profits, and labor is primarily interested in the largest possible payrolls, both objectives call for the same basic conditions. Payrolls depend upon the prospects for profits. If bad relations between business and labor or unwise public policies cause employers to take a pessimistic view of the outlook for profits, both employment and payrolls will be depressed.

Individual unions and individual employers always will have differences over wages and hours and the status of labor in particular plants or in particular occupations. Some disputes on such issues are inevitable, but resort to arbitration and calm intelligence can help greatly in avoiding strikes in the long run. Cooperation between labor and management is an economic necessity. In our kind of economy, payrolls and profits both depend ***upon the willingness and the ability of business and labor to work together in creating the conditions under which enterprise flourishes.***

The foundation for intelligent and effective cooperation must be accomplished by skillful and imaginative managers in plants throughout the country who are willing to help unions with their problems, and who are able to interest union leaders and their members in the problems of business. Union members and their leaders are keenly interested as a rule in the efforts of management to win new markets. They know that jobs depend upon the success of managements in improving the product, adding new items to the line, and, less frequently, cutting costs and prices. Employees like to be kept informed about what management is doing, what problems it is meeting, and what success it is having. Most of all, they like to have an opportunity to contribute their ideas and suggestions.

The recent epidemic of strikes should not blind us to the fact that even today there are more plants where managements and unions are on good terms than ever before in the country's history. Consider, on the one hand, the extensive and constantly growing efforts of unions to train and develop shop stewards and, on the other hand, the efforts of employers to teach foremen how to carry out the new responsibilities imposed upon them by union agreements. Unions and management together are learning how to operate together such technical devices as time study and job evaluation. Managements which, several years ago, opposed the provision of umpires to interpret union agreements and to settle deadlocked cases today are taking the lead in suggesting such arrangements.

The war is reaching a crisis, and all groups in the country must be aware as never before of their common interests. This presents an opportunity which should be seized to lay the permanent foundations for more effective team work in American industry. Let history record that the days when Europe was being liberated also were the days when unions and employers were making unprecedented progress in preparing American industry for the return of the service men by developing policies of cooperation between business and unions. Such cooperation will help achieve a peace worthy of our efforts and our sacrifices.



President, McGraw-Hill Publishing Company, Inc.

When your construction job calls for . . .

A TOUGH AIR COMPRESSOR

. . . . SCHRAMM FITS THE BILL!

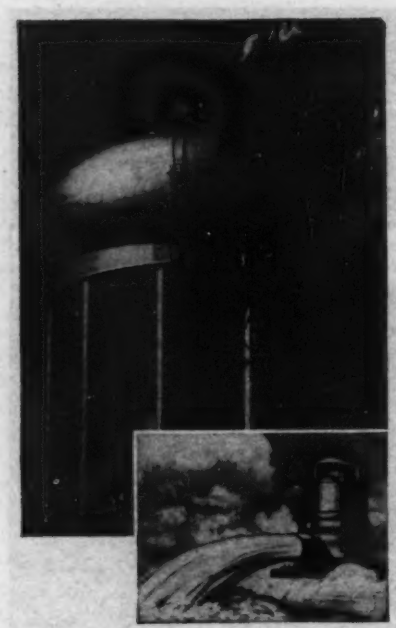
"LOOK CARLOS-MIRACLES NEVER STOP-WE SIT IN SHADE AND ARE OVERHEATED-YET THE SCHRAMM COMPRESSOR WORKS WITH SLIDE DOORS CLOSED AND DON'T GET OVERHEATED!

So you've another tough construction job that calls for an air compressor *able to stand anything?*

This ruggedness you specify—it's a big feature in Schramm Air Compressors. Note, for instance, in the above action picture how easily Schramm is doing the compressed air job—and giving all the air needed.

And—during these hot summer months—the fact that Schramm Compressors are completely watercooled to give service equal to winter weather months, means an advantage worth noting.

Schramms are lightweight—compact—sturdy units. If you are not already using a Schramm Air Compressor, it will pay you to write at once for illustrated Bulletin EC-44.



ON THE

"SWING SHIFT"

And Around the Clock . . .

Time means nothing to a finely engineered, sturdily built and properly installed Layne Well Water System. Throughout the twenty-four hours of each day it must be in perfect—and thoroughly dependable working order. A sudden water failure could bring disaster.

Layne Well Water Systems—thanks to more than sixty years of world-wide experience, are as near failure proof as human skill, manufacturing honesty and quality materials can make mechanical equipment. Even the metals used in contact with the water are varied to assure longer life where corrosive conditions are encountered.

In addition to sturdiness in build and quality of materials used, Layne Well Water Systems and Layne Vertical Turbine Pumps are famous for their high efficiency. Such efficiency effects substantial savings each year.

To get all that you expect and must have in a dependable and long lasting water system, and to eliminate worry of failure, always choose a Layne Well Water System. Fully illustrated literature may be obtained by addressing Layne & Bowler, Inc., General Offices, Memphis 8, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada

LAYNE

WELL WATER SYSTEMS

DEEP WELL PUMPS

BUILDERS OF WELL WATER SYSTEMS FOR INDUSTRIES AND MUNICIPALITIES

Association Elections and Activities

Guy W. Pinck, deputy chief engineer of the New York State Department of Public Works, was elected president of Albany County chapter, New York State Society of Professional Engineers, May 16, succeeding Clayton L. Miller. Others elected: E. J. Burnham, vice president; Herbert A. Lasher, secretary-treasurer; and P. O. Ferris and Leonard F. Mayer, directors.

Floyd Cotton of Asheville, N. C., has been elected president of the Engineers Club of Western North Carolina. He succeeds Julian B. Stepp, also of Asheville. Other officers elected are: Lee M. Bauer, of Asheville, vice president; M. G. Lyon, of Canton, N. C., secretary; and Samuel Robinson, of Asheville, treasurer. G. H. White, of Asheville, and W. D. Harrison, of Brevard, N. C., were elected members of the board of directors. Holdover members of the board are Cotton and Fred Doutt, of Canton, N. C.

At Lake Wales, Fla., recently, the Scenic Highlanders, a group representing 10,000 residents of 14 central Florida communities, met to celebrate the completion of their first objective, the rebuilding of Route 8 from Haines City south. Governor Holland and other officials attended. Plans were adopted to work for better roads in the area, particularly for a super-highway from the Georgia line through Central Florida. Judge Robert T. Dewell, Haines City, was elected president of the organization.

The more than 300 members of the Engineering Society of Cincinnati, Ohio, who have joined the society within a year were recently honored at a meeting held at the Herman Schneider Foundation. The society's roster now includes 800 names.

George L. Depew, Alger County, Mich., highway engineer, was elected president of the Upper Peninsula Road Builders' Association at the recent annual meeting at Houghton, Mich. C. L. Marley, Ontonagon County, was elected vice president and W. A. Gray, Marquette County, secretary-treasurer.

The Texas Good Roads Association has asked Congress for immediate enactment of legislation to provide after the war a great national highway program. The association also urged local communities in Texas to perfect plans for postwar road construction. Another resolution asked the legislature to submit a constitutional amendment to forbid any diversion from the road program of gasoline taxes or license fees excepting the present 25 percent allocated to public schools. Tom Eplen of Abilene was elected president of the association, succeeding John Redditt of Lufkin.

Elwyn C. Balch, chief engineer Michigan Bell Telephone Co., Detroit, has been elected president of the Engineering Society of Detroit. Also elected are the following officers and directors: First vice-president, Harold S. Ellington; second vice-president, Harry T. Woolson; secretary, James M. Crawford; treasurer George R. Thompson; assistant treasurer, Walter I. Knapp. The other directors are T. A. Boyd, retiring president, C. J. Freund, dean of the College of Engineering, University of Detroit; and A. N. Goddard.

Leonard N. White, Little Rock, Ark., is the newly elected head of the Arkansas Society of Professional Engineers. Other officers elected are Fred J. Herring, Little Rock, first vice-president; W. W. Mitchell, Arkansas state highway director, second vice-president and E. L. Wales, Little Rock, secretary-treasurer. Cyrus H. Bond, Marion, Ark., was elected northeast district director and Harry M. Wright, Little Rock, central district director.

E. F. Nelson, former president of the Little Rock, Ark., Engineers Club and the Arkansas Engineers Club, has been appointed head of the industrial and research division of the Greater Little Rock Chamber of Commerce, to assist in establishing new industries and the postwar re-conversion of industries.

A Junior engineers' group is being formed in the Ottawa, Ont., district for graduate engineers 35 and under. Similar junior Engineering Institute of Canada groups exist in Peterborough, Montreal, and Arvida. Main speaker at an organization meeting was Prof. Robert Leggett of the University of Toronto, who told of engineering organizations in Canada and explained recent developments in the professional engineering field as to collective bargaining. Flight Lieut. W. E. Cowie of the Royal Canadian Air Force was elected first chairman of the new group; R. Harvey Self, vice-chairman

TODAY A JUNGLE
TOMORROW A RUNWAY

WILL THEY EVER mount a Diesel Tractor alongside the cannon on a courthouse lawn to honor this great combat weapon? Anyway, it's an idea! For here's a peace-time builder that's a sensation on the battlefield, winning praises from GIs and Generals alike—moving dirt, rock, sand, frozen tundra and jungle swamp—by the ton and in a hurry.

Tens of thousands of International Tractors are serving the military—in the Army, the Navy, the Marine Corps and the Air Forces. Tractors pave the way for airpower, footpower and firepower . . . *All honor to the men who drive them!*

While these tractors are fighting on the battlefront, it's up to all tractor operators to conserve equipment here on the home front. *Make it last!* Harvester and the International Power Distributors stand ready to see you through.

If your need for new equipment is vital to the war effort, we will have equipment for you. If your need is less vital we will safeguard your present International Power with every service at our command.

And in the meantime, let's all remember that it's up to all of us to fight harder on the home front . . . fight on the food front—give to the blood bank—buy extra War Bonds—fight inflation. FOR VICTORY.

INTERNATIONAL HARVESTER COMPANY
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INTERNATIONAL HARVESTER
Power for Victory . . . Power for Peace

• The Carver "Certified" Tag means that the pump carrying it will stand up under tough assignments. It means that your Carver has been proved satisfactory both in the laboratory and on the job. It guarantees that the pump will go to work at once and keep on working at high efficiency.

Look for a Carver when you want rugged performance on road jobs. Write today for catalog, prices, deliveries, and name of dealer in your territory. No obligation, of course.

...the Road Contractor's Pump

THE CARVER PUMP CO.
MUSCATINE, IOWA

CARVER CENTRIFUGAL
Certified PUMPS

and Flying Officer R. Mantle, secretary-treasurer.

W. H. Baker of Raleigh, N. C., has been elected president of the Carolina Roofing and Sheet Metal Contractors Association to succeed Gordon Water. Other officers are: L. K. Flynt, Charlotte, N. C., vice-president; V. L. Ramseur of Greenville, S. C., second vice president; W. T. Fort of Sumter, S. C., secretary-treasurer. Directors are: George Averette, Charlotte, N. C.; Horace T. King, Wilmington, N. C.; Joe Piper, Greenville, S. C.; Hilton Bowles, Hickory, N. C., and Victor King, Sanford, N. C.

Charles H. Tompkins has been elected president of the Washington, D. C., Building Congress; Irwin S. Porter, Charles T. Penn, and A. W. Lee, vice presidents. Other officers: John G. Scharf, secretary; and W. H. Church treasurer. George E. Graham, and M. C. MacKinnon, were made directors.

Frank G. Horton is now manager-secretary of the Engineering Society of Detroit, succeeding the late Ernest L. Brandt.

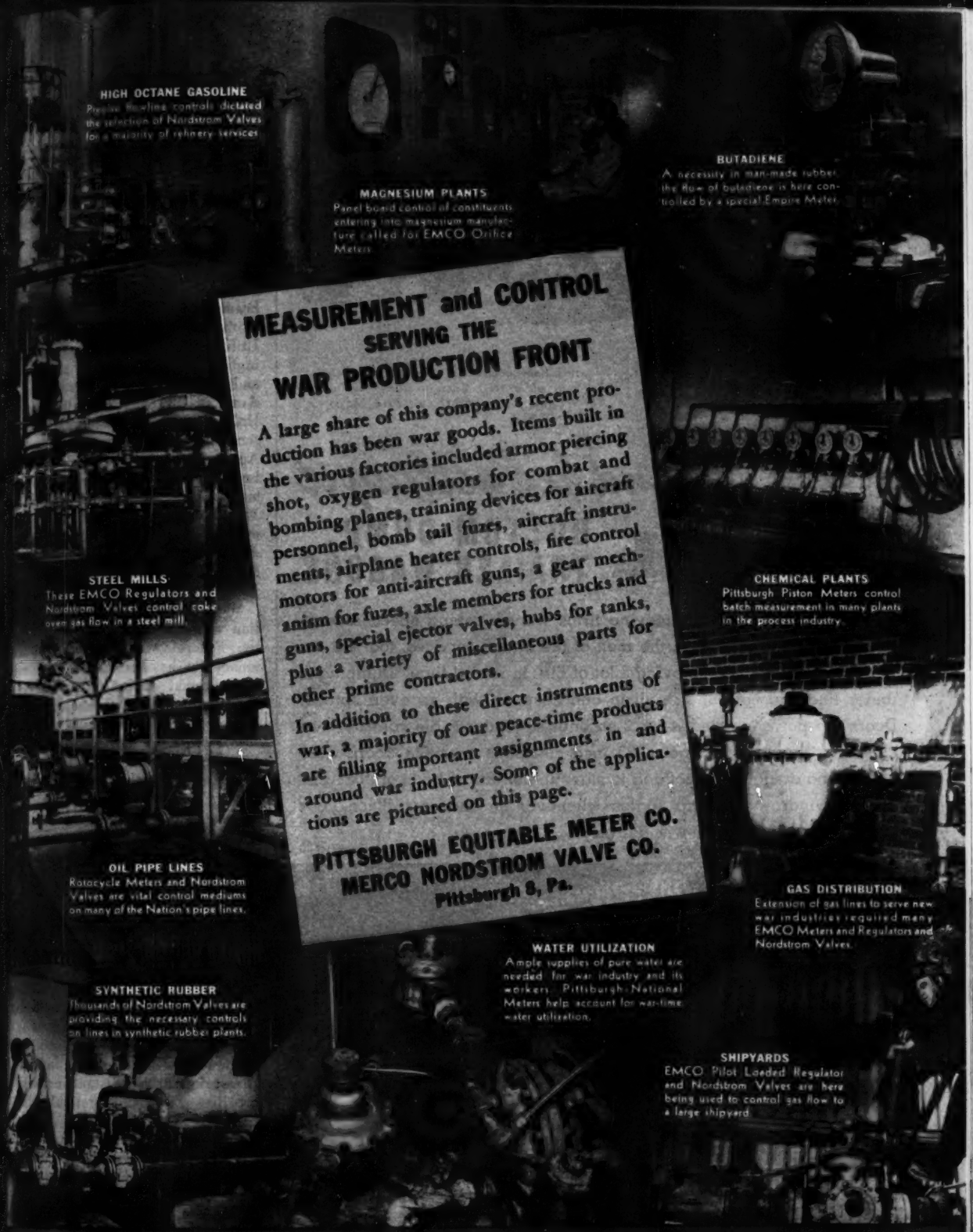
Floyd Cotton is president of the Engineers Club of Western North Carolina, succeeding Julian B. Stepp. Other new officers: Lee M. Bauer, vice-president; Samuel Robinson, treasurer, and G. H. White, W. D. Harrison and Julian B. Stepp, directors.

Officers of the Arkansas Society of Professional Engineers are: Leon N. White, Little Rock, president; Fred J. Heering, Little Rock, first vice-president; W. W. Mitchell, highway director, second vice-president, and E. Wales, secretary-treasurer.

The Carolinas Road Builders Association, Raleigh, N. C., has been incorporated with no capital stock to serve highway contractors in North and South Carolina. Incorporators are Nello L. Teer, Jr., Durham, N. C., and F. D. Cline, and W. D. Matthews, Raleigh, N. C.

Ernest M. Hammond, president of the Gravel Products Corp., Buffalo, N. Y., has been elected a trustee of the Western Savings Bank of that city.

Clinton R. Taplin has been elected president of the Milwaukee chapter of the National Association of Home Builders; James R. Baer, vice president, and Harris K. Evans, treasurer; and Sidney F. Dwyer, J. Douglas Edwards, Charles W. George, and R. B. Wall, directors.


HIGH OCTANE GASOLINE
Precise flow-line controls dictated the selection of Nordstrom Valves for a majority of refinery services
MAGNESIUM PLANTS
Panel board control of constituents entering into magnesium manufacture called for EMCO Orifice Meters
BUTADIENE
A necessity in man-made rubber, the flow of butadiene is here controlled by a special Empire Meter.
MEASUREMENT and CONTROL SERVING THE WAR PRODUCTION FRONT
A large share of this company's recent production has been war goods. Items built in the various factories included armor piercing shot, oxygen regulators for combat and bombing planes, training devices for aircraft personnel, bomb tail fuzes, aircraft instruments, airplane heater controls, fire control motors for anti-aircraft guns, a gear mechanism for fuzes, axle members for trucks and guns, special ejector valves, hubs for tanks, plus a variety of miscellaneous parts for other prime contractors.
In addition to these direct instruments of war, a majority of our peace-time products are filling important assignments in and around war industry. Some of the applications are pictured on this page.
PITTSBURGH EQUITABLE METER CO.
MERCO NORDSTROM VALVE CO.
Pittsburgh 8, Pa.
STEEL MILLS
These EMCO Regulators and Nordstrom Valves control coke oven gas flow in a steel mill.
CHEMICAL PLANTS
Pittsburgh Piston Meters control batch measurement in many plants in the process industry.
OIL PIPE LINES
Rotacycle Meters and Nordstrom Valves are vital control mediums on many of the Nation's pipe lines.
GAS DISTRIBUTION
Extension of gas lines to serve new war industries required many EMCO Meters and Regulators and Nordstrom Valves.
WATER UTILIZATION
Ample supplies of pure water are needed for war industry and its workers. Pittsburgh-National Meters help account for war-time water utilization.
SYNTHETIC RUBBER
Thousands of Nordstrom Valves are providing the necessary controls on lines in synthetic rubber plants.
SHIPYARDS
EMCO Pilot Loaded Regulator and Nordstrom Valves are here being used to control gas flow to a large shipyard.
PITTSBURGH-NATIONAL
Meters

Up where it's cold, the boys have built-in this home-made cab over the driver's seat of a Heil Bottom-Dump Trailer Wagon to ward off sub-zero blasts.

and he's getting it

with **HEIL** **BOTTOM-DUMP TRAILER WAGONS**

Before the war, many dirt-moving firms were breaking speed records with this Heil unit. Today, the men of the armed services, too, are doing the unbelievable in moving a lot of dirt, in record time. Dumping is under fingertip control . . . all in one heap, or with an even spread. Doors are power-opened — in 2 seconds — under cable control (they close by gravity). You get a 35 inch clearance with the doors wide open — no dragging — nothing to slow up the unit. The operator turns off the windrow at sharp angles whenever he chooses. Place your order now for early post-war delivery.

R-32

THE HEIL CO.

GENERAL OFFICES MILWAUKEE 1, WISCONSIN

MEN AND JOBS

Maj. B. A. Poole, chief sanitary engineer of the Indiana state board of health, on leave since July, 1942, with the Sanitary Corps, has been transferred from the post of regional sanitary engineer of the Sixth Service Command with headquarters in Chicago, to the office of the Chief of Engineers, Repair and Utility Branch, War Department, Washington, D. C., to supervise all the water and sewerage plants operated by the Army in the continental limits of the United States. **Capt. Paul W. Reed,** senior sanitary engineer on leave since April, 1942, with the U. S. Army, has been transferred from the post of sanitary engineer in charge of Camp McCoy, Wis., to become regional sanitary engineer of the Sixth Service Command comprising Illinois, Wisconsin and Michigan, with headquarters in Chicago.

William F. Barrett, chief construction engineer in the regional office of the Federal Works Agency in Richmond, Va., has been promoted to assistant regional director. He takes over the position formerly held by C. L. Vickers, who was appointed regional director when Kenneth Markwell resigned to accept an appointment as assistant commissioner of the Bureau of Reclamation in Washington.

Lewis P. Gattis, construction engineer in the FWA regional office, is acting as chief construction engineer, taking over Mr. Barrett's former duties.

The engineering staff has been increased by the appointment of three construction engineers—Pat B. Smith, transferred to Richmond from the regional office of the Federal Public Housing Authority in Atlanta; Kenneth M. Adelstein, formerly employed by the Smaller War Plants Corporation, with headquarters in Richmond, and John D. Rives, formerly assistant manager of the Ross Fibre Corporation's plant at Hopewell.

Lieut. Col. George R. Schneider has been appointed acting district engineer at Little Rock, Ark., to replace **Col. A. M. Neilson,** who has been ordered overseas. Colonel Schneider went to Little Rock from New Mexico in 1937. A University of Wisconsin man, he joined the U. S. Engineers in 1934 and was assistant engineer on the Muskingum project in Ohio and on projects in Texas and New Mexico.

The appointment of **George H. Haley** district highway engineer at Bowlin

...een, Ky., as head of the rural high-... division, has been announced by ...hway commissioner J. Stephen Wat-... of Kentucky. Haley, a graduate of ... University of Kentucky will replace ... T. Rye, resigned.

The St. John, N. B. town planning ...mission has engaged **Harold Law-...**, of Montreal as a consultant on ...ans to improve housing after the war. ...e city council is negotiating with **... C. Merritt**, of Montreal, an engineer ...ecializing in housing, to direct plans, ...cluding slum clearance.

In order to meet the shortage of de-...gn engineers in preparing the post-...r program, the Kansas Highway Com-...ission has transferred the following ...nstruction engineers to the design ...partment at the Topeka office: **Walter ... Thomas, Wm. S. Adams, J. B. Steph-...son, C. E. Grove,** and **M. G. Seibel.** ...he following have been assigned to ...an survey parties: **C. L. Trapp, E. G. ...der, R. W. Cory, G. W. Carr, J. O. ...rmstrong, Homer J. Johnson, John H. ...rter,** and **Milford Johnson.**

Albert MacCullaugh Levy has been ...med engineer of the re-established ...chnical division of the Metal Lath ...anufacturers Association of Cleveland, ...hio, with which he was associated as ...ssistant to the chief engineer for five ...ars following his graduation, in 1935, ...om the College of Engineering, Uni-...rsity of Illinois. The division will ...ssist architects, designers, and con-...ractors on metal lath engineering and ...esign. Since 1940, Mr. Levy has been ...ith the office engineering division, de-...artment of operations and mainte-...nance, Panama Canal Zone, and with ...argent and Lundy, consulting engi-...eers in Chicago.

Robert Johnson, city engineer of ...noxville, Ia., has become Hardin ...ounty engineer. He was engineer of ...arion county for 21 years.

Walter L. Smith of Raleigh, N. C., ...rmerly vice president of the North ...arolina Equipment Co., recently was ...romoted to the rank of lieutenant ...olonel in the Army Corps of Engineers, ...uropean Theater of Operations.

Vernon F. Hobbs, of Raleigh, N. C., ...ngineer with the bridge department of ...he North Carolina State Highway De-...artment prior to entering the Army, ...as been promoted to captain in the ...ost Engineers at Camp Croft, Spartan-...urg, S. C.

Maj. Lynn S. Kreger, Clear Lake, ...inn., for more than a year district ...rmy engineer at Duluth, has been ap-

"Pals" of G. I. Joe *right now* . . .

HEIL

Cable Dozers

are demonstrating their ability to "take it" on the fighting fronts of the world . . . . .

When peace returns,

famous Heil Cable Dozers will be available. Now, they're needed for the tougher job of clearing the way on the fighting fronts . . . digging in to soft dirt or hard-packed clay with ease . . . leading the way for for men and equipment in their march toward victory.

Heil Cable Dozers are engineered to work with International Harvester TracTrac-Tors as a perfectly balanced team. The simplified mounting avoids obstructing the operator's view — gives him full vision ahead. Here is a machine that performs smoothly — gives fast, positive action under the toughest conditions, with minimum maintenance. Get yourself a post-war "priority" by placing your order now.

Write for bulletins.

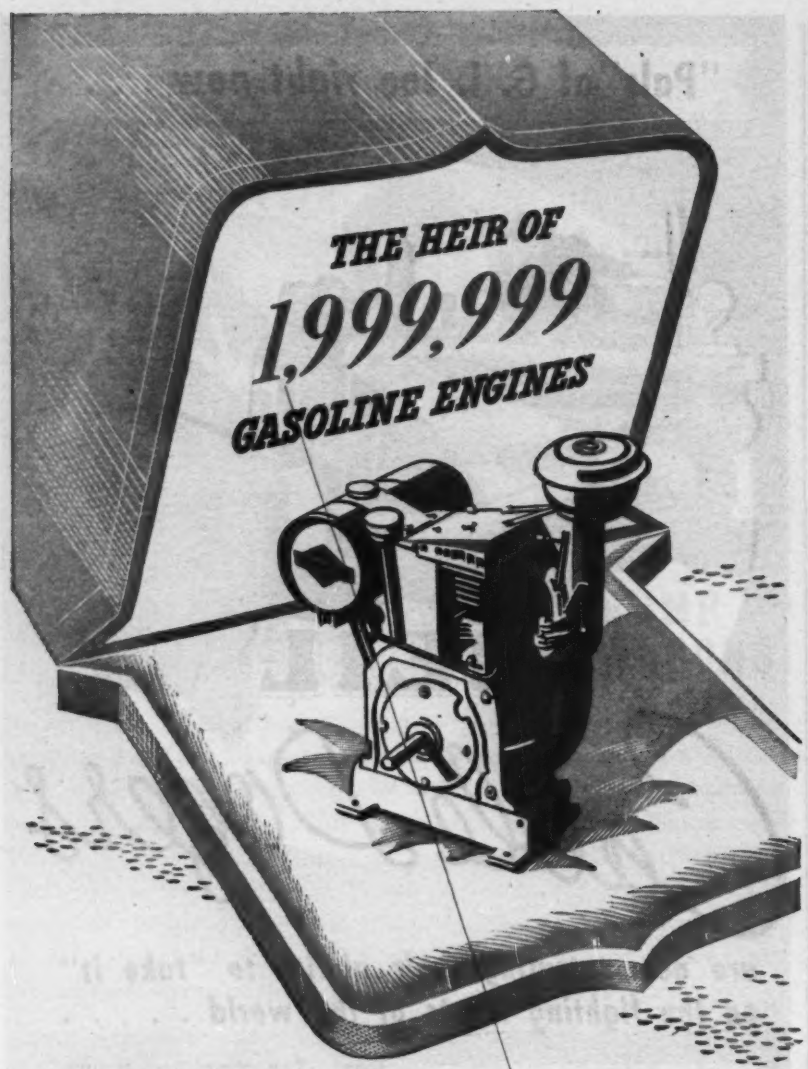
B-31

SEE YOUR INTERNATIONAL TRACTRACTOR DEALER

ARMY NAVY

THE HEIL CO.

GENERAL OFFICES MILWAUKEE 1, WISCONSIN



Recently the TWO MILLIONTH Briggs & Stratton engine moved off our production lines. We are now well started on the THIRD MILLION.

Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

We of Briggs & Stratton are proud of the endorsement of manufacturers, dealers and owners — and proud to be recognized as leaders in design, engineering and research, as well as precision production — the results of *twenty-five years* of continuous production of air-cooled gasoline engines.
BRIGGS & STRATTON CORP., MILWAUKEE 1, WISCONSIN, U. S. A.

pointed resident engineer in charge of construction of the $24,000,000 addition to the Badger Ordnance Works near Baraboo, Wis.

J. G. Taggart has been appointed minister of the new department of reconstruction of the Province of Saskatchewan, Canada.

Reginald W. McColough, formerly deputy minister and chief engineer of the highway department of Nova Scotia, has been appointed general manager of the Dufferin Construction Co., Ltd., Toronto, Ont.

George L. Lindsay, assistant director, has been appointed director of tests and research, Universal Atlas Cement Co., United States Steel Corp., subsidiary, succeeding O. L. Moore, retired after thirty years of service.

H. Harvey Perkins of Atlanta, Ga., supervisor of airports for the Civil Aeronautics Administration, Department of Commerce, is supervising the erection of new equipment at the Greensboro-High Point, N. C., airport. H. D. Locke, of Atlanta, assistant airways engineer, is in charge of the project.

Bion L. Humber, post engineer at Fort Amador, Canal Zone, has been promoted to first lieutenant from second lieutenant. Formerly employed as a construction engineer in New York City and New Jersey he is a graduate of the University of Kentucky.

Harry Lowe, formerly with Sloan and Cook, consulting engineers, has been named chief of the Materials Control Branch of The War Production Board. He was serving as chief of the Materials Control Section of The Communications Division of the Office of War Utilities. He succeeds **Charles F. Weiler,** who has been named assistant director of the Office of War Utilities.

Francis Chiaverini, chief of the division of public buildings of Rhode Island, has been appointed supervising architect for public buildings for post-war planning, by Daniel J. Ryan, director of the state department of public works. His headquarters will be at 1051 North Main St., Providence, R. I.

Col. Lacey V. Murrow, former Washington state director of highways, has been awarded the Legion of Merit for his invention of a device which is said to have saved the lives of many bulldozer operators. He was on duty in the South Pacific area. Col. Murrow headed the Washington highway department from 1932 to 1940.

"Most Valuable Machines on the Job" . . . says contractor of his ADAMS MOTOR GRADERS

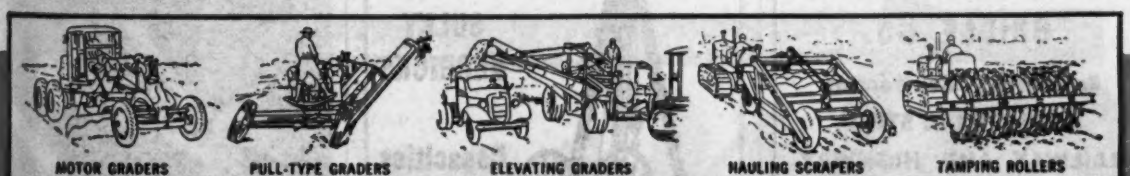
One of a series of ads on Adams motor grader features

"We use our Adams Motor Graders in a dozen and one different ways," says a midwest road contractor, "and because they are so versatile, they are just about the most valuable machines on our jobs. Depending upon the job, of course, we use them for cutting back and finishing banks, for cutting and finishing the ditches, and for bringing the sub-grade to specifications. If the job happens to be a blacktop or stabilization mix, the graders do the mixing and spreading. The scarifier comes in handy many times and I am thinking perhaps we should have one of those bulldozer attachments for the front end of the machine for pushing rubbish off the right-of-way and for minor leveling operations."

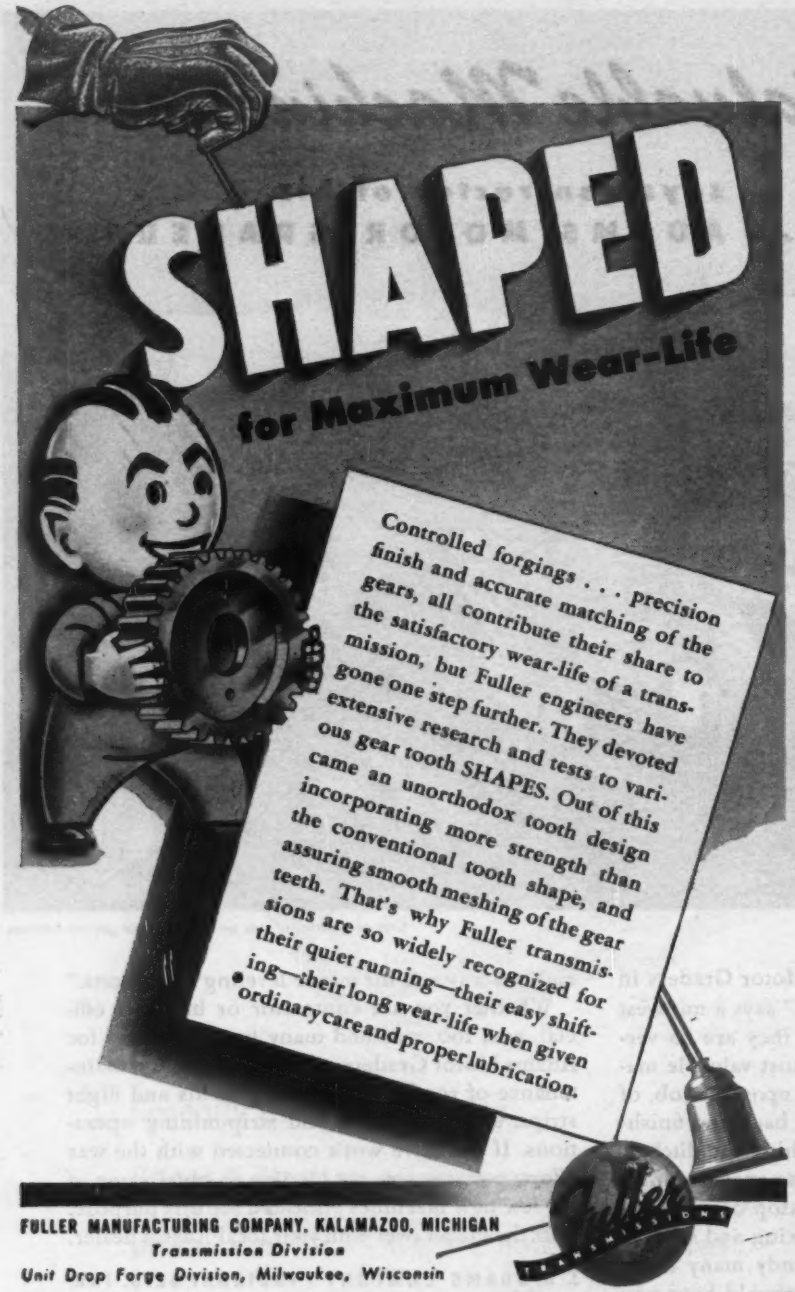
Whether you are contractor or highway official, you, too, will find many profitable uses for Adams Motor Graders on the building and maintenance of roads and streets, airfields and flight strips, and in logging and strip-mining operations. If you have work connected with the war effort, perhaps you are eligible to obtain one of the few new machines allocated for this purpose. Talk the matter over with your local Adams dealer.

J. D. ADAMS COMPANY · INDIANAPOLIS, IND.

At war's end we'll need many new roads and many jobs for returning service men. Plan post war projects now and meet both needs.



ADAMS ☆ ROAD-BUILDING AND ☆ EARTH-MOVING EQUIPMENT


SHAPED
for Maximum Wear-Life
Controlled forgings . . . precision finish and accurate matching of the gears, all contribute their share to the satisfactory wear-life of a transmission, but Fuller engineers have gone one step further. They devoted extensive research and tests to various gear tooth SHAPES. Out of this came an unorthodox tooth design incorporating more strength than the conventional tooth shape, and assuring smooth meshing of the gear teeth. That's why Fuller transmissions are so widely recognized for their quiet running—their easy shifting—their long wear-life when given ordinary care and proper lubrication.
Fuller
TRANSMISSIONS

FULLER MANUFACTURING COMPANY, KALAMAZOO, MICHIGAN
Transmission Division
Unit Drop Forge Division, Milwaukee, Wisconsin

float, and a chrome steel valve and valve seat; when the moisture that has been dropped to the bottom of the separator rises sufficiently to raise the float, the valve opens and the liquid drains out.

The separator, with capacities of 80 or 160 cu. ft. of free air per minute at 90 lb. pressure, has, respectively, inlets of ¾, 1 or 1¼ in., and 1½ or 2 in.—*Johnson Corp., Three Rivers, Mich.*

• • •

Marine Diving Compressor

Designed to supply air for marine diving, where more than one diver is working, a new standard Schramm

compressor provides different pressures for work at different levels. This compressor is a No. 315 gasoline engine driven unit, with a 24 x 72-in. horizontal air tank mounted overhead.—*Schramm, Inc., West Chester, Pa.*

• • •

Power Brush

Many times faster than hand preparation of steel for paint, it is claimed, is power brushing with a new portable, tool driven brush. The cup-shape brush, approximately 3¼ in. in dia., filled with .020 S.A. wires extending ¾ in. out of the cup, spins at 4,200 rpm.

when driven by the portable hand motor.

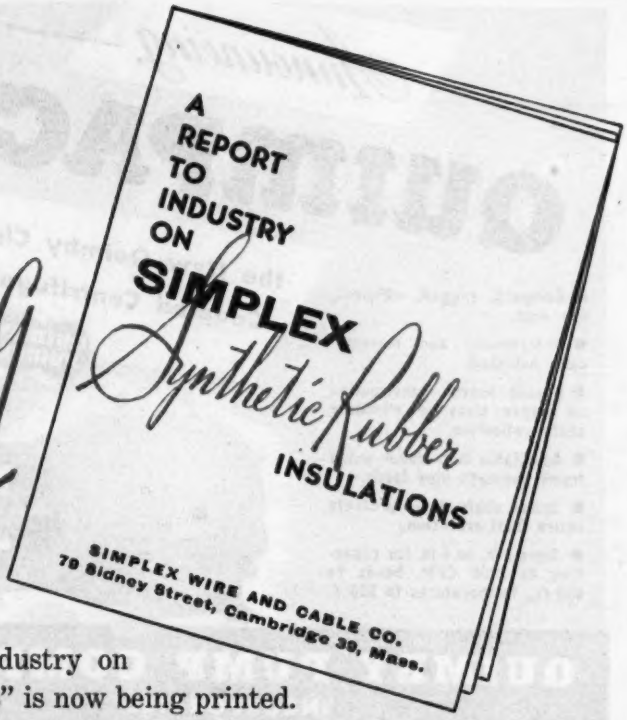
This power-driven unit is said to re-

THE MOUNT VERNON BRIDGE CO.
Engineers Contractors
STRUCTURAL STEEL
RAILWAY AND HIGHWAY BRIDGES
BUILDINGS AND VIADUCTS
MOUNT VERNON, OHIO

Bobbie Foundry & Machine Co.
Niagara Falls, N. Y.

SULKY DERRICKS
Capacities 3500 to 10,000

Announcing



A booklet entitled "A Report to Industry on Simplex Synthetic Rubber Insulations" is now being printed. You will want a copy because it is an up-to-date report of rapid progress and remarkable results in the transition during the past months from natural to synthetic rubber insulations and sheaths for wires and cables. It shows how Simplex quality is being maintained by the technical knowledge and manufacturing skill that enables us to get best results with the new materials.

The report contains valuable information that proves that synthetic compounds, when properly designed, are equivalent in service to the natural rubber insulations and sheaths they have replaced. Our chemical and engineering laboratories have done notable work in developing these new materials upon which we depend for Simplex quality and Simplex service.

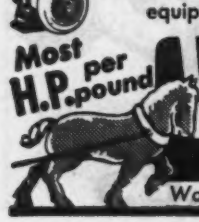
As soon as the report is ready for distribution we would like to send a copy to you because we believe it will be of real interest. Your request for it by postcard or letter will receive prompt attention.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex WIRES and CABLES

Absolute uniformity and close-tolerance fit of all connecting rod bushings are direct results of the unique machine operation illustrated above. Each rod is rigidly locked in precisely the same position, and diamond-pointed bits machine both ends of every rod with uncanny smoothness and perfect mechanical precision. All of this helps to produce a quiet, smooth-running engine, designed and built for heavy-duty service all the way through.

All of which adds up to highly satisfactory *end use* on your equipment.



WISCONSIN MOTOR
Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

move fog and spray-deposited salt, as well as loose scale and paint, from steel surfaces.—*The Osborn Manufacturing Co., Brush Division, 5401 Hamilton Ave., Cleveland, Ohio.*

• • •

Revolving Field Generator

Available in all standard voltages and frequencies, a new Katolight revolving field generator can be furnished as an independent two-bearing generator for belt or coupling drive, or as a single-bearing machine to fit standard SAE engine bell housing. This engine is conservatively rated and will carry 25 per-

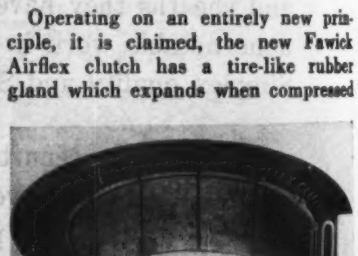
cent overload without exceeding allowable temperature rise, it is claimed. Voltage regulation is approximately 10 percent, with 2-cycle speed change.

The frame is cast of high grade gray iron, with legs cast integral with frame. Lifting rings are provided to facilitate handling. The machine is furnished with an amortisseur or damper winding to permit parallel operation of two or more generators.—*Kato Engineering Co., Mankato, Minn.*

• • •

Compressed Air Clutch

Operating on an entirely new principle, it is claimed, the new Fawick Airflex clutch has a tire-like rubber gland which expands when compressed



air enters, and thus effects positive clutching action. Lubrication and adjustment are said to be unnecessary, due to the absence of toggles, arms, springs, levers or bearings.

This clutch can handle heavy or light loads. The gland insures uniform pressure over the entire clutch space.—*Fawick Airflex Co., Cleveland, Ohio.*

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

GRADING FOR "FLOATING ROAD" NORTH CAROLINA

OWNER: North Carolina State Highway and Public Works Comn., Raleigh.

PROJECT: Grading, hydraulic fill between point 195 ft. east of Pasquotank River Bridge and Camden, Camden County, N. C. on Route No. 158. Approximately 2.33 miles in length. Work under this contract includes clearing; removal of unsatisfactory material within construction limits; drainage ditch excavation; placing of pipe and headwalls, and right-of-way markers; and construction of embankment.

CONDITIONS: Contractor to furnish all materials and complete work in 450 calendar days. Rail, highway and water transportation facilities available. Traffic to be maintained on present road, causeway bridge, and on the necessary temporary structures during construction. Borrow area provided by Commission where contractor may obtain fill material without cost. No wage rates specified, but contractor's attention is directed to the Fair Labor Standards Act of 1938, and the application is the responsibility of contractor.

BIDS: Eight bids were opened May 9, 1944, ranging from low of $316,813 to $694,798.

LIST OF BIDDERS:

1. R. C. Huffman Constr. Corp., Norfolk, Va. (low bidder) $316,813
2. W. L. Cobb Constr. Co., Decatur, Ga. 379,566
3. Atlantic Dredging Constr. Co., Pine Bluff, Ark. 386,171
4. Norfolk Dredging Co., Norfolk, Va. 399,972
5. The Arundel Corp., Baltimore, Md. 440,900
6. Diamond Constr. Co., Washington, D. C. 499,936
7. C. Walker Hodges Dredging Co., New Bern, N. C. .. 546,810
8. Merritt Dredging Co., Charleston, S. C. 694,798

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	26 ac.	$300.00	$300.00	$300.00
2. Unclassified excavation	1,000 c. y.	.85	3.00	1.00
3. Excavation of unsatisfactory material	591,300 c. y.	.205	.166	.15
4. Drainage ditch excavation	100 c. y.	1.00	2.00	1.00
5. Borrow excavation	899,300 c. y.	.205	.30	.32
6. Class C. concrete headwalls	3 c. y.	50.00	60.00	60.00
7. 36-in. rein. concrete pipe	76 l. f.	30.00	5.00	8.00
8. Right-of-way markers	6 ea.	10.00	10.00	2.00

FERRY LANDINGS, TEXAS

OWNER: Texas State Highway Dept. Austin.

PROJECT: Construction of two ferry landings and slips serving ferry running between north and south sides of Houston Ship Channel, near Pasadena, Harris County, Tex. Involves erection of two steel I-beam spans, one 30-ft. with concrete dock and rail, and one 30-ft. movable with open mesh steel deck. Length of project is 0.034 miles. Roadway width 36-ft. Piling clusters tied in with ¾-in. galvanized cable.

CONDITIONS: Contractor to furnish all materials and complete project in 175 working days. AA-3 preference rating approved by WPB. Rail, highway and water transportation facilities available. Wage rates specified are: skilled labor $9.00 per 8-hr. day; semi-skilled, $6.00 per day; and common labor $4.80 per day.

BIDS: Five bids were received May 18, 1944, ranging from the low of $131,967 to $177,941.

LIST OF BIDDERS:

1. Ole Peterson & Son, Houston, Tex. (award pending) $131,967
2. Brown & Root, Inc., Houston, Tex. 138,186
3. Austin Bridge Co., Dallas, Tex. 147,679
4. R. P. Farnsworth & Co., Inc., Houston, Tex. 150,890
5. Tellepsen Constr. Co., Houston, Tex. 177,941

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Common channel excavation	22,800 c. y.	$1.00	$1.00	$1.75
2. Unclassified struct. excavation	80 c. y.	4.00	3.00	3.25
3. Class A concrete (pavement)	90 c. y.	25.00	20.00	35.10
4. Class A concrete (slabs)	56.62 c. y.	45.00	35.00	35.10
5. Class A concrete (bents)	67.8 c. y.	45.00	40.00	35.10
6. Reinforcing steel	30,708 lb.	.075	.07	.0575
7. Structural steel (spans and counterweights)	136,880 lb.	.09	.12	.1065
8. Structural steel (face plates)	40,250 lb.	.08	.10	.095
9. Open mesh steel decking	2,168 s. f.	2.00	2.75	2.05
10. Hardware	16,050 lb.	.85	.55	.4825
11. Treated timber (20# full cell)	36.201 Mbm.	220.00	300.00	451.50
12. Remove old structures (under 20-ft. span)	2 ea.	500.00	200.00	105.00
13. Remove old structures (over 20-ft. span)	2 ea.	500.00	1,000.00	1,350.00
14. Untreated timber test piling	4 ea.	150.00	325.00	110.80
15. Treated timber piling (20# full cell)	29,385 l. f.	1.80	1.85	1.54
16. Railing (Type 1)	120 l. f.	7.50	7.00	6.50
17. Railing (Type 2)	120 l. f.	5.00	7.00	8.55
18. Shovel sodding	220 c. y.	1.00	3.00	4.00

HIGHWAY AND BRIDGES, MISSISSIPPI

OWNER: State Highway Dept. of Mississippi, Jackson.

PROJECT: Grading, drainage structures, bridges, and gravel surface course on 20.085 miles of the Military Training Road (known as access road to Mississippi Ordnance Plant), at Flora Ordnance Plant, Madison County, Miss. Roadway width is 16, 20, 24 and 26 ft.; width of surfacing is 10, 12 and 16 ft. Surfacing thickness at center, 1, 2 and 3 in. Same thickness at sides.

CONDITIONS: Contractor to furnish all materials and complete work in 120 working days. Rail and highway transportation facilities available. Minimum wage rates are: skilled labor, 75c.; semi-skilled, 40c.; common, 30c.

BIDS: Three bids were received April 18, 1944, ranging from the contract low of $85,316 to $98,701.

LIST OF BIDDERS:

1. Memphis Stone & Gravel Co., Memphis, Tenn. (contract) $85,316
2. E. W. Hable & Sons, Corsicana, Tex. 89,228
3. Cobb Bros. Constr. Co., Inc., Meridian, Miss. 98,700

Roadway

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old bridge (Sta. 240+27)	Lump Sum	$100.00	$75.00	$990.00
2. Unclassified excavation	10,000 c. y.	.50	.60	.90
3. Machine work	200 hr.	7.50	12.50	10.00
4. Gravel surface course (semi-gravel)	12,636 c. y.	3.20	3.20	3.75
5. 15-in. pipe culvert	78 l. f.	2.50	2.20	3.60
6. 18-in. pipe culvert	63 l. f.	3.00	3.20	3.60
7. 24-in. pipe culvert	156 l. f.	4.00	4.00	4.40
8. 30-in. pipe culvert	24 l. f.	5.00	6.00	6.05
9. 36-in. pipe culvert	24 l. f.	6.00	8.00	7.15
10. Class B culvert concrete	420.16 c. y.	29.00	32.50	32.00
11. Reinforcing steel	59,873 lb.	.06	.06	.065

Bridges

12. Remove old bridge (Sta. 243+99.5)	Lump Sum	800.00	250.00	165.00
13. Remove old bridge (Sta. 99+66)	Lump Sum	200.00	100.00	165.00
14. Grave. surface course (semi-gravel) (ballast)	62 c. y.	3.20	3.20	3.60
15. Treated timber	47.725 Mbm.	195.00	200.00	190.00
16. Cl. B. box bridge concrete	162.79 c. y.	30.00	32.50	32.00
17. Reinforcing steel	22,390 lb.	.06	.06	.065
18. Treated timber piling	2,050 l. f.	2.00	2.20	1.85
19. Test piles	2 ea.	200.00	200.00	200.00

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

JULY CONSTRUCTION material prices and construction labor rates show only minor changes from the preceding month. Portland cement is 20c per barrel higher in Baltimore, and ready-mixed concrete is higher in Baltimore, Boston and New York. Short-leaf yellow pine is $3.00 to $5.00 higher in Atlanta and $1.00 to $4.00 higher in Baltimore.

Common brick prices increased in Atlanta, Baltimore and Detroit, and structural clay tile prices are up in Boston and Cleveland. Concrete sewer pipe is 5c. per foot higher in Baltimore. Paving brick is up in Baltimore, but lower in Cleveland and Detroit.

Rates for common construction labor in Boston formerly ranged from 80c. to $1.00, but that gap has closed, and the higher rate, $1.00 per hour, now prevails. Skilled construction hourly rates remain unchanged from a month ago.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT—Per bbl., C/L lots, incl. 40c. per bbl. for bags, cash dis. not deducted			SAND AND GRAVEL—Per ton, carload lots			CRUSHED STONE—Per ton, carload lots		CRUSHED SLAG—Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK 8x8x16-in.; truckload del.; per block		CONCRETE Ready Mixed 1:2:4, over 50 c.y., del.
	Cloth a	Paper	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand-grav.	Lt.wgt. Agg.	
Atlanta	$2.77	$2.52	$2.47	$1.79	$1.89	$1.99	$1.70	$1.89	$1.59	$1.69	$0.17	....	$8.00
Baltimore	2.53	2.28	2.03	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	.125	$0.125w	7.35
Birmingham	2.50	2.25	2.10	1.75	1.75	1.50	.85	1.00	.90	1.15	.1425	....	5.80
Boston	2.97b	2.72b	2.52	1.50‡	1.50‡	1.05‡	1.25‡	1.35‡	....	....	.13	.155w	7.55m
Chicago	2.70	2.45	2.30	2.15‡d	2.15‡d	2.15‡d	2.15‡d	2.15‡d	1.70‡	1.75‡	.16	.16x	....
Cincinnati	2.31	2.06	1.81	1.20	1.10	1.80	1.80	1.80	....	....	.12	.15w	6.60
Cleveland	2.39	2.14	....	1.75i	1.75i	1.55i	1.80i	1.80i	1.73i	1.73i	.14	.15	7.30i
Dallas	2.52	2.27	2.07	1.50p	1.70p	1.10p	1.69p	1.79p	....	....	.15	....	6.20
Denver	3.08	2.88	2.32	1.20	1.30	1.25	1.65	1.75	1.00	1.00	.15	....	7.25
Detroit	2.39	2.14	1.99	1.50	1.50	1.50	2.25	2.25	2.00‡	2.00‡	.13	.14w	7.00
Kansas City	2.58	2.33	2.18	1.85	2.30	1.00	1.91	1.91	....	....	.125	.125wy	7.50s
Los Angeles	3.00v	2.40v	....	1.30	1.30	1.15	1.30f	1.30f	....	....	.045bb	.10aa	7.25
Minneapolis	2.90	2.65	....	1.00h	1.00h	.25h	1.00h	1.00h	....	....	.12	.16	7.10j
Montreal	....	1.95rs	1.79rs	....	1.65‡t	2.05‡t	1.05ct	1.15ct	....	....	.14t	.14wt	7.90s
New Orleans	2.41	2.16	1.96	1.65	1.65	.99	....	....	....	....	.19	....	9.25
New York	2.89‡	2.64‡	....	1.60de	1.60de	.90de	1.70de	1.80de	....	....	.14	.14wcc	7.75k
Philadelphia	2.53	2.28	2.08	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	.155	.155w	8.20
Pittsburgh	2.45	2.20	2.00	1.65‡	1.65‡	1.35‡	2.25‡	2.25‡	1.50	1.50	.17	.17z	8.25
St. Louis	2.80	2.52	....	1.75‡	1.75‡	1.25/1.50‡	1.10h	1.10h	.75g	.75g	.13	.15y	8.00
San Francisco	....u	2.21	1.91	1.36	1.36	1.36	1.46	1.46	....	....	....	.20aa	7.55
Seattle	2.95o	2.75o	....	1.00o	1.00o	1.00o	2.00o	2.00o	....	....	.16	.16y	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2½ percent for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* Price withdrawn. *v* 20c. per bbl. discount; 20c. allowed for returnable cloth bag. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Pumice. *bb* 4 x 8 x 12 in. *cc* Also 8 x 18 x 18 in.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn.	$1.80	$1.75
Dallas, Tex.	....	....	Limedale, Ind.	....	....	Steelton, Minn.	1.80	1.75
Hannibal, Mo.	1.70	1.65	Norfolk, Va.	....	....	Universal, Pa.	1.65	1.60
Hudson, N. Y.	....	....	Northampton, Pa.	1.75	1.70	Waco, Tex. (Plus 9c. tax in Tex.)	1.75	1.70
Independence, Kans.	1.70	1.65	North Birmingham, Ala.	....	....	Montreal (8% sales tax incl.)	1.68	1.67
						Discount 10c. per bbl. 20 days		

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F.O.B. CITY

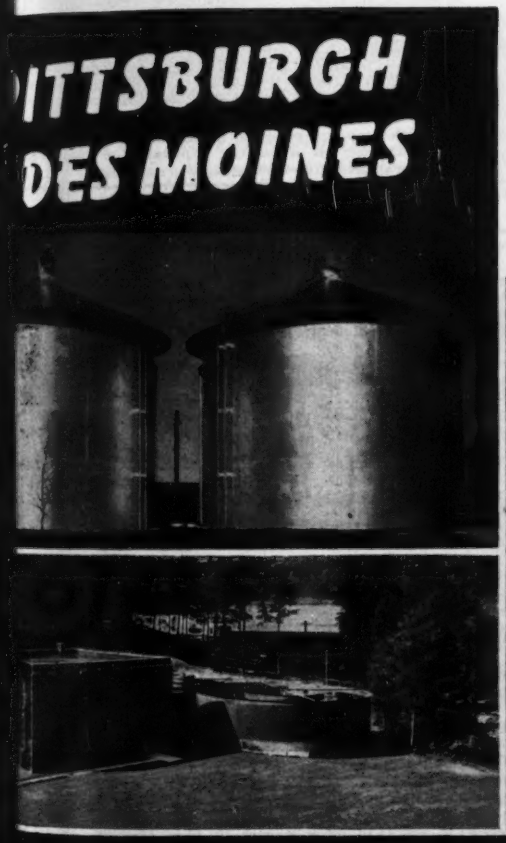
	PAVING BRICK AND BLOCK: Granite per M. lots of 50,000	Brick per M 3x4x8½ in.	Wood per sq. yd. 3½ in.	PAVING ASPHALT: Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES: Per gal., 80-300 penetration		CUTBACK ASPHALT: Per ton		ROAD OIL: Per gal.	ASPHALT EMULSION (Quick-breaking): Per gal.	
	4x4x8 in.	carload lots	16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$18.53e	$24.62e	$0.0740e	$0.1309e	$0.0802he	$0.1348h	$0.0676e	$0.0826	$0.1384
Baltimore	150.00‡	49.00	82.50m	15.00r	21.00r	.06r	.09r	13.00r	23.00r	.065r	.07r	.14r
Birmingham	150.00	48.00	.....	17.95	.....†	.0747	.....†	.0834h	.....†	.065	.09	.....†
Boston	85.00	59.00	3.75	17.00	24.00	...20	...22	25.00	30.00	.....	.1125	.1325
Chicago	150.00	55.00	2.50/2.80d	14.00	22.50	13.00g	21.50g	.0575h	.15h	.05n	.09/10n	.13/.15n
Cincinnati	120.00	50.00	.....	16.40	.....	.085	.....	12.25	.....	.07	.085	.....
Cleve'and	118.00	37.25	2.50	16.00	18.00	.085	.095	.10h	.....	.095	.095	.....
Dallas	.....	36.00	.....	13.65	20.30	.06	.11	16.00	24.80	.06	.05/.07	.07/.09
Denver	.....	16.11	.....	11.00	.....	10.00	.....	.045h	.....	.....	.....	.....
Detroit	.....	37.00	.....	18.06f	25.60f	.0743	.128	.0718h	.119h	.067	.0775	.1149
Kansas City	.....	40.00	.....	18.50	23.50	.077	.1075	.077h	.107h	.057	.11	.15
Los Angeles	.....	50.00	.....	9.00b	23.00	9.50bg	24.00bg	9.50b	.....	.025	.072	.15
Minneapolis	.....	.....	2.30d	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	92.40	.....	.....	16.60k	24.25k	.116k	.1485k	.115hk	.135hk	.08k	.135k	.188k
New Orleans	.....	.....	.....	13.50a	20.00a	.057	.088	.06h	.095h	.....	.080	.....
New York	.....	65.00	.....	17.40	24.20p	14.00	.....	.0725h	.1325hp	.....	.0725p	.119p
Philadelphia	140.00	58.00	4.06	15.00r	.....	14.00r	.....	.065hr	.....	.....	14.00pr	.....
Pittsburgh	135.00	38.75	.....	18.00	23.00	.09	.16	20.00	36.00	.07	.06	.11
St. Louis	.....	37.00	.....	16.00	22.00	15.00g	21.00g	.0575h	.1212h	.648	.0525	.1125
San Francisco	.....	40.00	.....	10.90	21.15	10.90g	18.00gr	12.90	17.50r	9.50gr	.0525	.1125
Seattle	.....	60.00c	.....	10.90i	23.40i	.....	20.40gi	11.40i	.....	.....	.0525i	.0625i

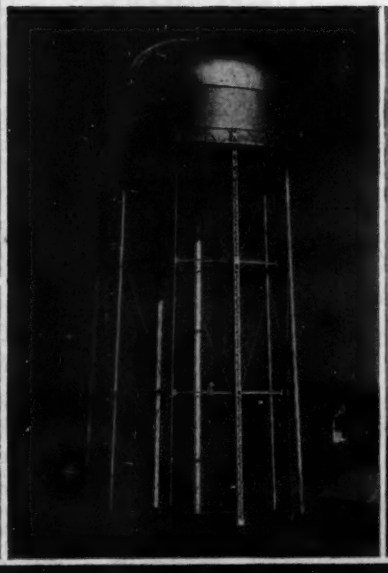
‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 12-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* Tax included. *m* Per thousand. † Available on priority only and quoted specially. *p* No steel drum shipments except to armed forces. *r* February 1943 prices, none later available.

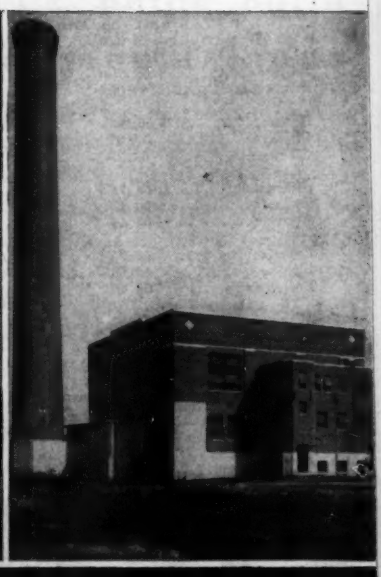
POST-WAR QUESTION for TODAY:

Opposite to the practical advantages of present planning for the future, are the serious drawbacks connected with delay. Municipal executives who wait 'till war's end to initiate needed construction must then plan under pressure —will find competent engineering services pre-engaged by many—and may experience strong competition for contracting facilities in the general rush to build. Trade hectic activity *later* for considered planning *now* . . . arrange your financial, engineering and construction programs with expert technical assistance, for better design and lower eventual cost! *We'll be glad to consult with you.*

Blueprint Now







PITTSBURGH • DES MOINES STEEL CO.

PITTSBURGH, PA. 3412 NEVILLE ISLAND—DES MOINES, IOWA, 913 TUTTLE STREET

NEW YORK, ROOM 915, 270 BROADWAY · CHICAGO, 1216 FIRST NATIONAL BANK BUILDING

DALLAS, 1217 PRAETORIAN BUILDING · SAN FRANCISCO, 619 RIALTO BUILDING

SEATTLE, 1120 EIGHTH AVENUE, SOUTH

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ½-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.27‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.47*a*	2.52*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	3.05	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone, Steelton, Pa., spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¼ in., base price: 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. yd., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.40	$2.40	$.02½	$.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	22.50	24.50	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	.1701	....
Boston	3.912	3.994	....	$20 C.L.	.10	18.50	29.50	1.76	1.31	.1656	2.77
Chicago	2.10*a*	2.15	2.15	.03	.05	21.00	23.00	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.53*cd*	2.53*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	....
Cleveland	2.10*a*	2.15	2.15	.02½	.10	19.50	21.00	1.66	1.25	.1566	....
Dallas	4.25	3.17	3.17	.....	....	25.00	27.50	1.93	1.42	.1827	....
Denver	4.57	3.33*hl*	....	.....	....	26.50	26.50	1.97	1.45	.186	....
Detroit	3.65‡	2.52‡	2.52‡	.....	.10	30.00	30.00	1.68	1.26	.1584	2.86
Kansas City	4.19	2.61*cd*	2.61*cd*	.0	.05	24.50	26.50	1.78	1.33	.1683	2.874
Los Angeles	3.65*f*	2.575	2.425	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.81‡	2.73	2.73	.0	.10	25.00	27.00	1.80	1.34	.1701	2.73*l*
Montreal	4.00*i*	2.90*i*	2.80*i*	.....	....	26.00*hij*	33.00*hij*	2.25*i*	3.14*i*	.228*i*	....
New Orleans	4.229‡*k*	2.52	2.52	.05	.10	19.00	21.00	1.82	1.35	.1715	2.873
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.66	3.82	....	.....	....	19.50	21.50	1.71	1.28	.1611	2.72
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.697	2.74	2.74	.0	.05	28.00	34.00	1.89	1.27	.1602	2.70
San Francisco	4.35	2.825	2.675	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.85
Seattle	2.75*e*	2.80*e*	....	.....	....	34.50	38.50	1.93	1.42	.1827	2.95*el*

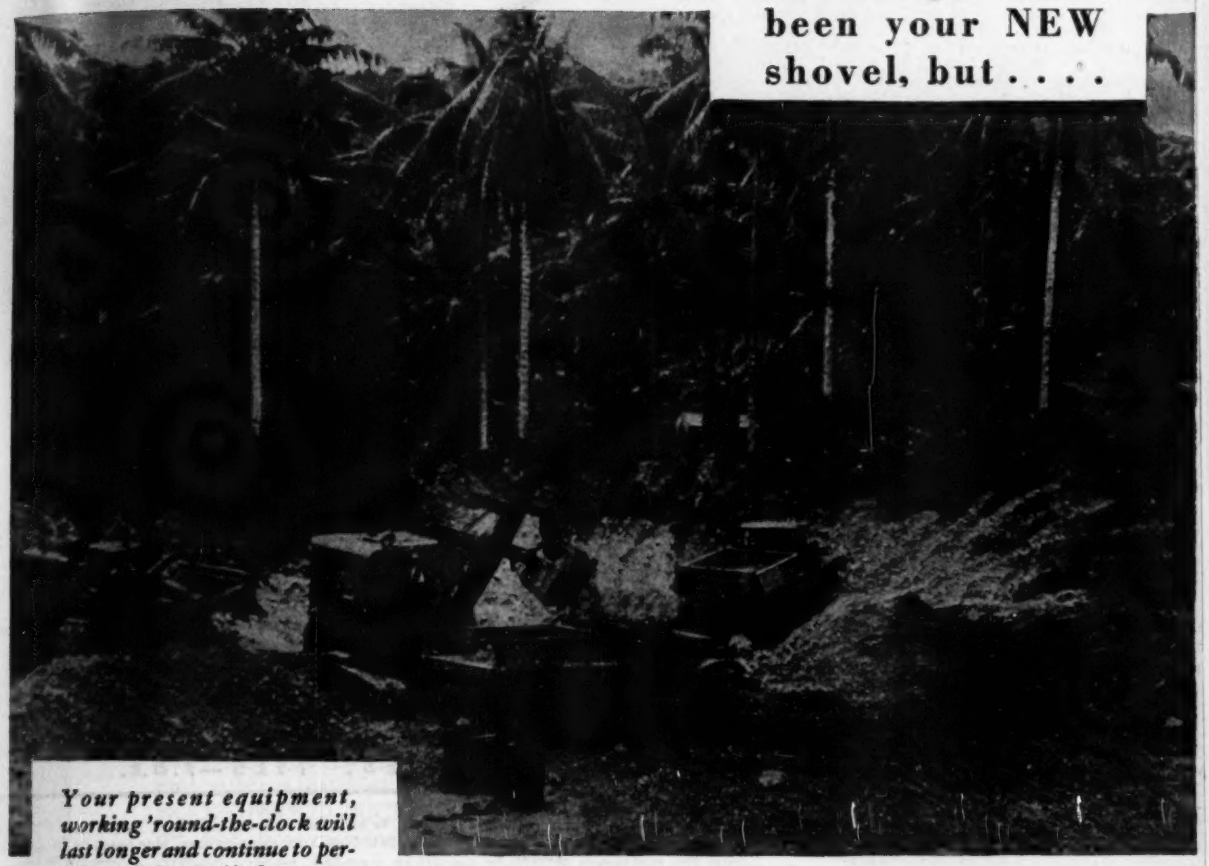
‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *j* August 1942 price; not on market. *k* Quotation on changed basis; actual price change. *l* Approximate Denver price out of wholesale stocks, based on Chicago area; not comparable with preceding prices.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE Per foot, std. 8 in., s.s.	Delivered std. 12 in., s.s.	ASTM 24 in.,	C13–35 36 in.	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h*: 1 to 3 in., Black %	Galv. %	Butt Weld 3½ to 6 in.; Black %	Galv. %	Lap W Galv. %
Atlanta	$49.66	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.2	54.2	59.7	51.2	
Baltimore	53.00	.35	.60	2.70	7.25	160.00	200.00	.55	1.80	65.5	57.5	63.0	54.5	
Birmingham	45.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2	
Boston	55.40	.371*r*	.7155*r*	2.70*r*	7.6875*r*	155.00‡*r*	245.00‡*r*	.60	....	....	....	....	....	
Chicago	54.33	.35	.675	2.70	7.00	100.00‡	150.00‡	.45	1.85	66.0	55.0	64.5	53.0	
Cincinnati	53.27	.231	.4455	1.80	5.125	105.00‡*s*	170.00‡*s*	.75*t*	1.75*t*	57.1	43.4	54.0	39.6	
Cleveland	54.75	.266*r*	.513*r*	2.115*r*	5.535*r*	90.60	139.40	.36	1.38	68.5	57.5	66.0	54.5	
Dallas	56.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3	
Denver	61.56	.29†	.52†	2.16†	3.00*m*	125.00	200.00	1.00	2.22	58.4	50.4	55.7	47.2	
Detroit	54.75	.35	.675	2.70	7.75	135.00	200.00	.40	1.75	57.6	44.0	54.5	40.2	
Kansas City	55.73	.315	.39	2.20	5.86	140.00	260.00	.45	1.60	35.9	46.4	46.6	59.9	
Los Angeles	68.40	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	61.1	50.1	58.6	47.1	
Minneapolis	57.47	.275†	.495†	1.98†	5.37†	.....	.....	.90	2.10	64.2	53.2	60.7	49.2	
Montreal	67.00	.85*o*	1.50*o*	5.25*p*	8.50*op*	45.00*m*	64.00*m*	.48*m*†	1.92*m*†	....	....	....	....	
New Orleans	51.78	.26	.48	1.69	....	150.00	220.00	.45	1.65	62.4	54.4	58.8	50.3	
New York	52.40	.308	.594	2.52	6.45	.....	.....	.60	1.40	64.9	53.9	62.4	50.9	
Philadelphia	51.00	.315	.61	2.60	7.50	150.00	225.00	.45	1.75	56.6	42.8	53.6	39.1	
Pittsburgh	56.00	.266†	.513†	2.295†	5.945	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*	
St. Louis	53.62	.28	.504	2.016	4.50	85.00	220.00	1.25*j*	2.25*k*	56.4	42.6	52.5	38.4	
San Francisco	68.40	.3625*d*	.6525*d*	2.61	6.52	115.00	192.50	.58	2.34	45.0	31.0	41.0	26.9	
Seattle	70.20	.375	.675	2.70	6.75	84.00	187.50	.51*j*	1.44*j*	....	....	....	....	

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N. J. (base) $49.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¾ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from producing lowest price at destination. WROUGHT IRON PIPE: Base and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½; 4 in. 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *l* Plus sales tax. *m* Tax included. *n* 27-in. pipe. *o* Less 50 *p* Less 53%. *r* Truck delivery. *s* Price quotations on delivered basis since May 1940; current f.o.b. price $84 for 6 in.; $130 for 8 in. *t* Reinforced pipe price since May, 1937; current plain pipe prices are: 12 in., 36c.; 24 in., $1.50.

This might have been your NEW shovel, but . . . .



Your present equipment, working 'round-the-clock will last longer and continue to perform efficiently if these common-sense rules are followed:

- **Insure proper regular lubrication.**
- **provide daily inspection to detect troubles while they are still small**
- **make adjustments when needed—don't wait**
- **tighten loose bolts and nuts**
- **keep fuel, lubricants and water clean**
- **remove clutch and brake bands and clean lining with good grade of clear gasoline**
- **change cables end-for-end to increase life of wire rope**
- **plan work to favor machine**
- **inspect engine regularly—flush radiator when dirty**
- **always give model and serial number when ordering repairs**
- **contact your BAY CITY distributor for parts and service.**

here again BAY CITY helps build airfields in the Solomon Islands

Throughout the Pacific theaters of operations the Seabees are making historic records in fighting and construction. Your new equipment—like this BAY CITY which is excavating coral deposit for an advanced airfield—has gone to war. And because there will be no new shovels or cranes released for civilian requirements until after the war is won, it is important that present equipment be kept in good operating condition. Observe the few simple, common-sense rules of maintenance. They will lengthen the life of your machine and help you keep going until new BAY CITY crawler or pneumatic tire mounted shovels, cranes or draglines are again available. In the meantime, we will be glad to send you catalogs and specifications so you will learn why BAY CITY offers such low-cost, dependable operation. Write Bay City Shovels, Inc., Bay City, Michigan.

BAY CITY SHOVELS

BAY CITY

SHOVELS • CRANES • DRAGLINES • TRENCH HOES

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better end for No. 1 N. C. Box. (Prices in Bold Face) *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*								LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 R4A	6x12 R4A	12x12 R4A	2x12 R4A	12x12 R4A	¼"	¾"
Atlanta	$40.00	$40.00	$37.00	$35.00	$34.00	$37.00	$46.00	.....	.....	$57.00	$64.00	$17.90	$21.85
Baltimore	40.44	46.00	44.00	46.00	47.00	52.00	65.00	.....	.....	115.00	120.00	18.25	22.25
	48.00	*48.00*	*55.00*	*55.00*	*55.00*	*57.50*	*68.00*	*$75.00*	*$75.00*	.....	.....	.....	.....
Birmingham	45.00	45.00	44.50	43.50	44.50	47.50	68.00	55.00	56.00	.....	.....	17.35	21.15
[1]	50.00	50.00	49.50	48.50	49.50	52.50	72.00	.....	.....	67.50	70.00	.....	.....
Boston ‡*	42.00[3]	45.00[3]	55.00[3]	60.00[3]	60.00[3]	65.00[3]	68.00[3]	.....	.....	72.00[3]	72.00	18.25	22.25
‡*	*50.00*	*50.00*	*55.00*	*60.00*	*65.00*	*65.00*	*72.00*	*72.00*	*72.00*	.....	.....	.....	.....
Chicago	54.00	54.00	55.00	54.00	54.00	60.00	68.00	.....	.....	80.00[l]	95.00[l]	14.60	17.80
	55.00	*55.00*	*54.00*	*54.00*	*54.00*	*55.00*	*80.00*	*56.00*	*57.00*	.....	.....	.....	.....
Cincinnati	47.50	49.00	42.50	42.50	42.50	44.50	67.00	.....	.....	65.00	65.00	17.35	21.15
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland	42.50[k]	42.50[k]	52.50[k]	51.00[k]	65.00	65.00	83.00	83.00	83.00	.....	.....	17.75	21.60
Dallas *c*	45.25	45.25	44.50	43.00	43.00	47.25	60.75	78.75	58.75	88.75	85.00	14.60	17.80
Denver ‡	63.50[3]	62.00[3]	65.00[3]	65.00[3]	65.00[3]	66.00[3]	69.00[3]	*83.00*	*89.00*	.....	.....	10.45	12.70
Detroit	61.00	61.00	57.75	57.75	57.75	62.75	72.75	75.00	90.00	70.75	90.00	17.35	21.15
	57.00	*57.00*	*57.00*	*57.00*	*62.75*	*62.75*	*71.00*	*76.00*	*76.00*	.....	.....	.....	.....
Kansas City *a*	69.00	69.00	67.00	65.50	67.00	69.00	84.00	.....	.....	84.00	94.00	12.60	15.40
	66.00	*66.00*	*59.50*	*59.50*	*59.50*	*59.50*	*76.00*	*80.00*	*80.00*	.....	.....	.....	.....
Los Angeles *a*	*60.00*	*60.00*	*60.50*	*60.75*	*59.25*	*59.25*	*78.75*	*78.00*	*78.00*	.....	.....	9.90*gh*	12.05*gh*
Minneapolis ‡*b*	50.00[3]	50.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.60	15.40
‡	*56.50*	*64.75*	*57.00*	*57.25*	*56.25*	*57.00*	*61.50*	*69.75*	*69.75*	.....	.....	.....	.....
Montreal †[7]	*58.00*	*61.00*	*54.00*	*58.00*	*60.00*	*66.00*	.....	.....	.....	200.00	200.00	.....	.....
	54.00	*54.00*	*57.00*	*57.00*	*57.00*	*58.75*	*68.00*	*68.00*	*68.00*	.....	.....	.....	.....
New Orleans	40.00	40.00	37.00	35.00	34.00	36.00	46.00	.....	.....	55.00	60.00	14.60	17.80
	51.00	*51.00*	*53.00*	*51.00*	*54.00*	*58.00*	*53.00*	.....	.....	.....	.....	.....	.....
New York	67.50	67.50	62.50	62.50	62.50	64.00	74.00	.....	.....	120.00*f*	125.00*f*	18.35	22.25
‡	.....	.....	*65.00%*	*65.00%*	*65.00%*	*65.00%*	[Range from $75 to $95]			.....	.....	.....	.....
Philadelphia	65.00	70.00	70.00	70.00	70.00	70.00	75.00	.....	.....	130.00	130.00	18.25	22.25
	70.00	*75.00*	*70.00*	*70.00*	*70.00*	*70.00*	*85.00*	*90.00*	*90.00*	.....	.....	.....	.....
Pittsburgh	58.00	53.20	62.75	55.00	60.85	62.50	76.25	.....	.....	.....	.....	18.10	22.05
	69.20	*68.10*	*66.10*	*65.20*	*65.20*	*65.68*	*88.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis ‡*e*	59.00	59.00	56.00	55.00	56.00	57.00	69.00	75.00	75.00	87.00	87.00	14.60	17.80
San Francisco *d*	*41.00*	*41.00*	*36.50*	*36.75*	*35.75*	*35.75*	*57.50*	*56.00*	*56.00*	.....	.....	7.30*g*	8.90*g*
Seattle	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*40.00*	*40.00*	*40.00*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [3] Roofers, N. C. Pine. [4] Spruce. [6] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax. * Prices for truck delivery; no longer quoting carload lots f.o.b. city.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ¾", $95.15; on ¾", $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $69. *j* Average price. *k* August 1943 price. *l* September price; none later available.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*	
Atlanta	75%	75%	$0.15	
Baltimore	78%	79%	.15	
Birmingham	76%	76%	.105	
Boston	77%	78%	.15	
Chicago	77%	77%	.15	
Cincinnati	77-10%	77-10%	.15	
Cleveland	77-10%	77-10%	.19	
Dallas	76%	76%	.1625	
Denver	76%	76%	.155*e*	
Detroit	77%	77%	.1575	
Kansas City	77-10%	77-10%	.155	
Los Angeles	86%*d*	88%*d*	.1575	
Minneapolis	77%	77%	.155	
Montreal	40-5%*ab*	47%*ac*	.1675†	
New Orleans	70%	75%	.16	
New York	81%	82%	.22*f*	
Philadelphia	78%	79%	.15	
Pittsburgh	79%	79%	.1225	
St. Louis	77-10%	77-10%	.155	
San Francisco	66%	73%	.155	
Seattle	75%	75%	.1575†	

Price of 60% Ammonia Gelatin in $0.01 per lb. higher than 40%

a Discount from list Sept. 1939; sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers' list Sept. 15, 1928.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal St. add delivery charge of $6.00 per trip. [1] F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.11 -.1175	.135 -.1475	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1125	.135-.1425	.155-.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail — Pine*	Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	....
12 in.—2 ft. from butt	6-in.	50 to 59-ft.	.35	....
12-in.—2-ft. from butt	6-in.	60 to 69-ft.	.36	....
12-in.—2-ft. from butt	6-in.	90 to 100-ft.	....	.515
13-in.—3-ft. from butt	5-in.	91 to 100-ft.	....	.5825
14-in.—2-ft. from butt	6-in.	50 to 69-ft.	.41	.62
14-in.—2-ft. from butt	6-in.	70 to 79-ft.	.43	.59
14-in.—2-ft. from butt	5-in.	80 to 85-ft.	.53	....
14-in.—2-ft. from butt	5-in.	85 to 89-ft.	.56	....
14-in.—2-ft. from butt	5-in.	90 to 100-ft.	....	.61

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

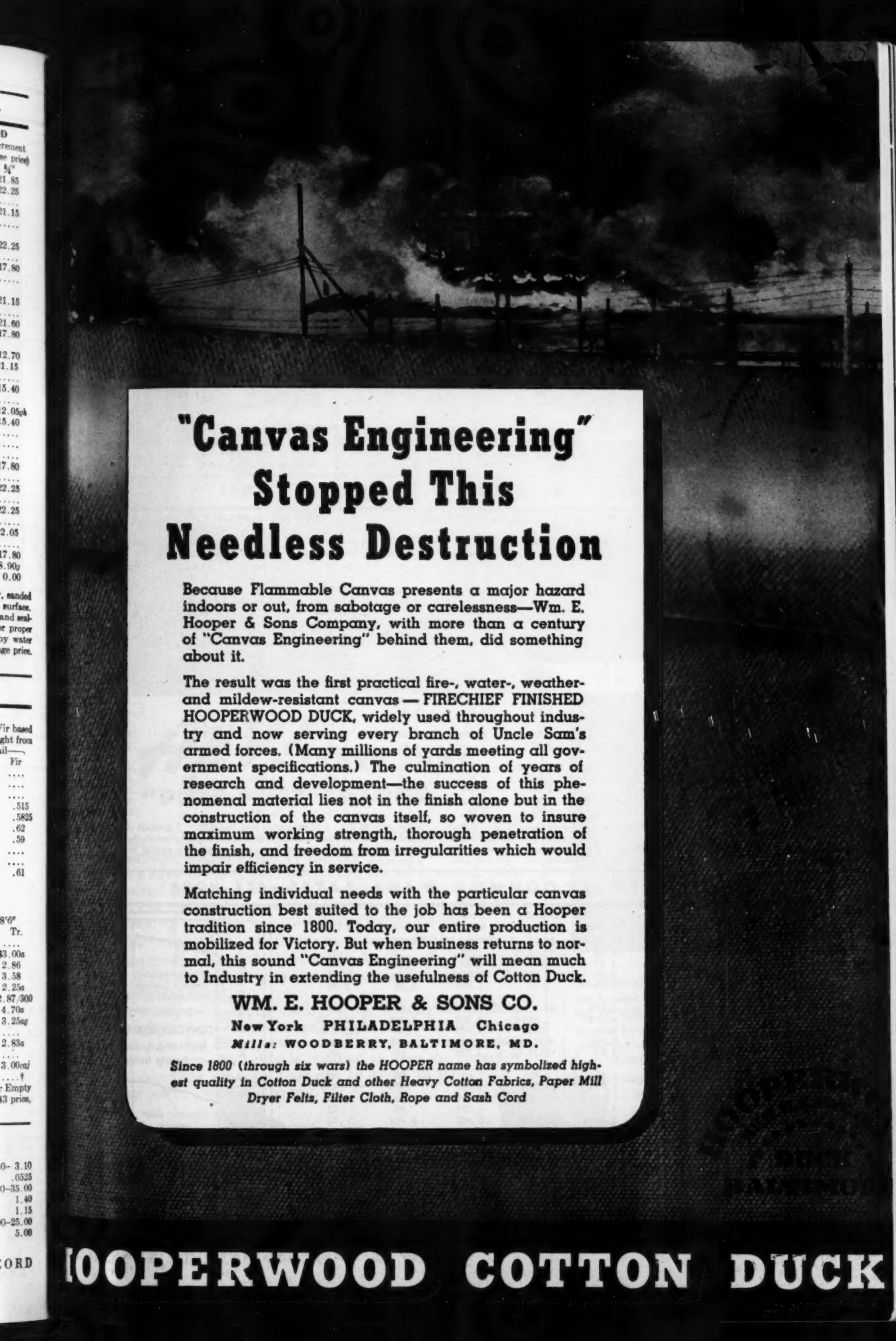
Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.50	....	$2.00	....
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	White Oak	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.00/2.25*a*	2.87	2.87/300
Los Angeles	Douglas Fir	2.00	3.25*a*	2.90	4.70*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.48	....	2.04	....
	Red Oak	1.48	2.05*a*	2.04	2.83*a*
	Sap Pine or Cypress	1.55	....	1.91	....
San Francisco	Douglas Fir	1.25*bef*	....	....	3.00*aj*
Montreal	Birch or Maple	.85	.95	....†	....†

Tr.—Treated; Untr.—Untreated. *a* Creosoted. *b* 6"x8"x8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January 1943 price, none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb.	$2.50- 3.10
Chlorine cylinders, liquid, per lb., delivered	.0525
Calcium chloride, 77-80%, flaked, 100-lb. paper bag, del'd, ton.	18.50-35.00
Silicate of soda, 52 deg. in drums, f.o.b. works, per 100 lb.	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb.	5.00



"Canvas Engineering" Stopped This Needless Destruction

Because Flammable Canvas presents a major hazard indoors or out, from sabotage or carelessness—Wm. E. Hooper & Sons Company, with more than a century of "Canvas Engineering" behind them, did something about it.

The result was the first practical fire-, water-, weather- and mildew-resistant canvas — FIRECHIEF FINISHED HOOPERWOOD DUCK, widely used throughout industry and now serving every branch of Uncle Sam's armed forces. (Many millions of yards meeting all government specifications.) The culmination of years of research and development—the success of this phenomenal material lies not in the finish alone but in the construction of the canvas itself, so woven to insure maximum working strength, thorough penetration of the finish, and freedom from irregularities which would impair efficiency in service.

Matching individual needs with the particular canvas construction best suited to the job has been a Hooper tradition since 1800. Today, our entire production is mobilized for Victory. But when business returns to normal, this sound "Canvas Engineering" will mean much to Industry in extending the usefulness of Cotton Duck.

WM. E. HOOPER & SONS CO.

New York PHILADELPHIA Chicago

Mills: WOODBERRY, BALTIMORE, MD.

Since 1800 (through six wars) the HOOPER name has symbolized highest quality in Cotton Duck and other Heavy Cotton Fabrics, Paper Mill Dryer Felts, Filter Cloth, Rope and Sash Cord

HOOPERWOOD COTTON DUCK

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE—PARTITION—SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE—LOAD BEARING—SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity. Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload lots, Pulverized or lump
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$15.00	$18.04	$26.54	$15.04	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	300.00	16.00*k*	20.00*k*	18.00	13.00	2.80*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25*n*
Boston	103.75*a*	110.65*a*	207.45*a*	248.90	283.00	323.40	20.00*i*	20.00*i*	21.00†	.....	16.00
Chicago	72.00	77.00	145.00	197.00	243.00	278.00	12.50	13.50	17.00	15.00	12.30
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	22.00	22.00	15.50	13.00	.....
Cleveland	62.75	66.95	125.50	150.60	201.90	231.15	17.00	17.00	15.75*j*	13.25*j*	3.30*m*
Dallas	62.50	67.50	135.00	162.00	212.50	263.00	13.50*i*	15.00*i*	19.00	15.00	15.00
Denver	84.80	95.40	153.70	178.20	212.00	227.90	14.50	18.00	25.00*j*	17.00*j*	20.00*j*
Detroit	92.70	98.70	181.20	206.75	267.50	306.00	20.75	21.75	18.00	16.00	16.00
Kansas City	67.00	69.00	89.00*c*	128.00	163.00	189.00	14.50	16.50	19.32	13.00	10.92
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	81.00*b*	86.40*b*	159.90*b*	.....	177.00*b*	246.00*b*	13.60	15.60*g*	21.00	16.00	19.00
Montreal	94.55*a*	100.45*a*	199.50*a*	160.45*a*	109.40*at*	137.40*au*	21.08†*u*	28.35†*u*	24.60*u*	18.00*u*	8.00
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*e*	193.30*h*	238.80*h*	295.60*h*	17.00/18.00	.....	20.00	14.00	17.00
Philadelphia	85.30	91.00	170.50	204.60	252.00	312.00	17.00	20.00	19.00	16.00	15.00
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	67.00	95.00	130.00	190.00	244.00	290.00†	18.00	17.00	22.00	18.00	2.50*m*
San Francisco	96.00	108.00	144.00	108.00	.....	.....	19.00	.....	24.00	23.00	2.50*m*
Seattle	115.00	125.00	230.00	.....	.....	.....	20.00*f*	21.00*f*	20.00*s*	20.00*s*	20.00*t*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *r* 5% discount 10 days. *s* 2% discount cash. *t* 5½x8x12. *u* 8% sales tax included. *v* 6x12x12-in. *w* Per 220 lb. bbl.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

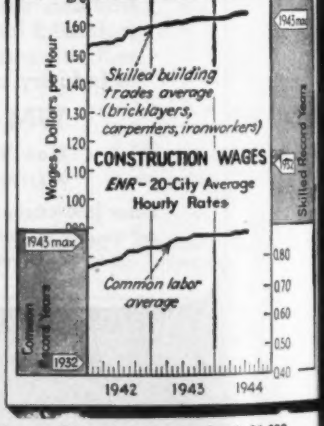
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *b*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50*r*	1.98*r*	2.04	1.97	1.97	.32	28.33
Boston	10.00	13.75	1.75	2.50	2.31	2.00‡*hs*	3.30‡*us*	3.30‡*us*	.25‡	21.00‡
Chicago	10.00	13.75	.....	.....	.....	1.75*hf*	1.74*hf*	1.82*hf*	.33*f*	23.00*f*
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.20	2.10*h*	2.10*h*	.33	25.00
Cleveland	10.00	13.75	1.70	2.90	1.60	1.93	1.83*h*	1.83*h*	.25	27.00
Dallas	10.00	14.50	1.88	2.11*n*	.05*l*	1.75*h*	1.66*h*	1.66*h*	.35	39.00
Denver	10.50	14.25	.....	.....	.27*l*	2.45	2.95	2.95	.35	28.00
Detroit	10.00	13.75	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	10.00	13.875	2.30*g*	2.55*gr*	2.16*g*	2.10	2.30	2.30	.28	27.30
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	.....	.45	.....
Minneapolis	10.00	13.875	.....	.....	.....	1.75*i*	1.66*hi*	1.66*hi*	.32	23.00
Montreal	9.25	6.25	2.50*p*	4.90*p*	3.15*p*	4.02*t*	2.58*t*	3.01*t*	.89*t*	F.2.10*t*
New York	10.00	13.75	2.03	....*r*	1.82	1.66	1.58*h*	1.58*h*	.26	25.00
Philadelphia	10.00	13.75	1.60/1.80	2.20*r*	1.55	1.75	1.66	1.66	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	10.00	13.75	2.28*s*	2.89*s*	1.96*s*	1.66	1.66	1.66	.28	22.00
San Francisco	10.25	14.00	1.80	2.75*n*	1.35	1.71	2.40	2.40	.33	20.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16*h*	....	.35	28.50*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3–49A. *c* ASTM Spec. D266–31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 *l* Per lb. *m* Per bbl. *n* May, 1941 price, no later quotation available. *p* P 8% sales tax. *r* Not available, except on priority rating; then quoted specia *s* December, 1942 price. *t* Federal tax included. *u* 90-lb. roll. *v* Truck deliv

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor—Building	Common Labor—Heavy Const.
Atlanta	$1.50	$1.25	$1.50	$1.25	$1.50	$0.40	$0.50
Baltimore	1.75	1.375	1.80	1.625/1.80	1.50	.75	.75
Birmingham	1.75	1.25	1.50	1.25/1.50	1.50	.65	.65
Boston	1.625	1.50	1.65	1.875	1.667	1.00	1.00
Chicago	1.75	1.70	1.76	1.75	1.825	1.10	1.10
Cincinnati	1.825	1.50	1.675	1.45/1.60	1.625	.85	.85
Cleveland	1.875*c*	1.375	1.875	1.875	1.875	1.085	1.15/1.25
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75/1.25
Denver	1.65*b*	1.50*b*	1.50*b*	1.50/1.625*b*	1.50*bf*	.80*b*	.80*b*
Detroit	1.725	1.50	1.75	1.675/1.75	1.725	.90	.90
Kansas City	1.65	1.50	1.625	1.625	1.65	.90	.90
Los Angeles	1.50	1.35	1.625	1.375	1.667	.875	.875
Minneapolis	1.625	1.44	1.625	1.50	1.625*e*	.95	.95
New Orleans	1.50	1.25	1.50	1.50	1.375	.65	.75
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*b*	1.10*f*	.95
Philadelphia	2.00	1.58	2.00	2.00	2.00	.825	.825
Pittsburgh	1.90	1.75	1.75	1.8125	1.875	.90	.80
St. Louis	1.75	1.50	1.75	2.00	1.75	.95	.95
San Francisco	1.875	1.50	1.75	1.50/1.75	1.75	1.00	1.00
Seattle	1.845	1.565	1.745	2.00	1.865	1.145	1.10
Montreal*	1.05	.95	1.00	.90	1.05	.60	.65

b 7 hr. day. *c* Prevailing rate on government work. *e* 35 hr. wk.
* Cost of living bonus now included in basic wage.



ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.638.
ENR Common Average: $0.882.

HEY! LEAVE THAT "PUTT-PUTT" ALONE

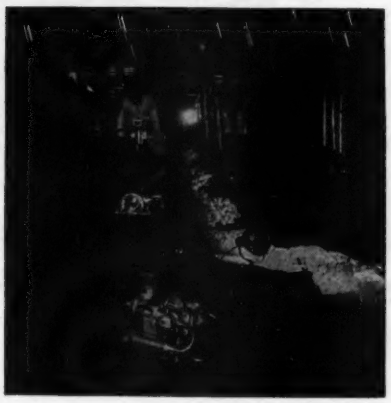
No soldier, you don't have to monkey around with that Homelite Portable Gasoline-engine-driven Generator.

You don't have to check the oil level . . . the oil is mixed with the gasoline and fresh, clean oil sprays over all moving parts at each revolution. For the same reason, there's no need to shut-down the unit to change oil . . . there's no oil sump to collect sludge.

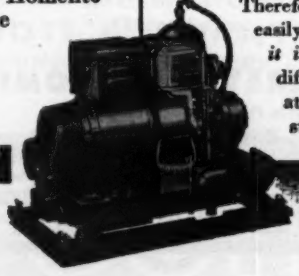
The engine is air cooled . . . so there's no water level to be checked.

No adjustments are required when the load on the generator changes . . . a simple built-in governor automatically keeps the engine at a constant speed.

When it comes to operating electric tools, floodlights, landing field marker lights, or even radio equipment . . . this simplicity of operation has proved an important advantage to all the branches of our armed services. Less time is required to keep the Homelite generators operating . . . more time can be given to the number one job . . . winning the war.



On construction work a Homelite Generator is used by a lot of different men for a lot of different jobs . . . the night gang uses it to operate floodlights . . . the day crew, for operating electric hand tools. Therefore, a Homelite must be easily operated by anyone. *And it is.* No fussing around. No difficult adjustments. No manual attention. Just set it up . . . start it . . . and let it purr.



HOMELITE CORPORATION

PORT CHESTER, NEW YORK

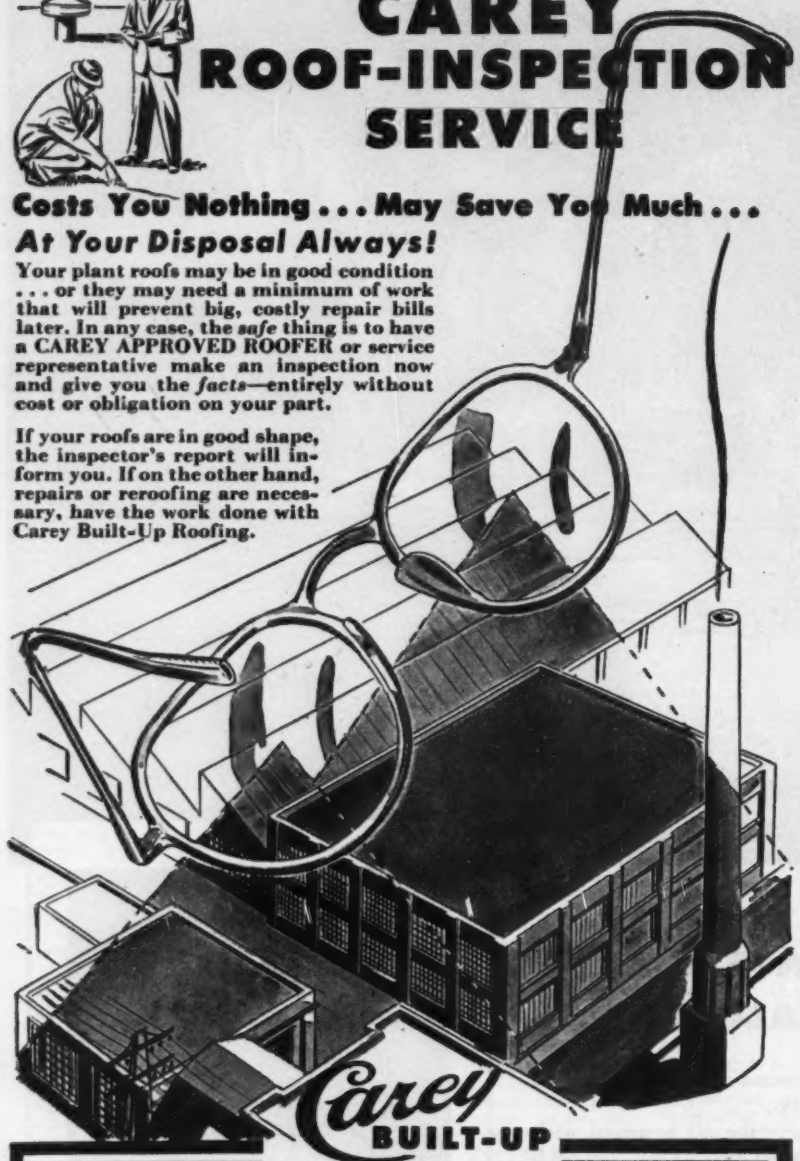
CAREY ROOF-INSPECTION SERVICE

Costs You Nothing . . . May Save You Much . . .

At Your Disposal Always!

Your plant roofs may be in good condition . . . or they may need a minimum of work that will prevent big, costly repair bills later. In any case, the *safe* thing is to have a CAREY APPROVED ROOFER or service representative make an inspection now and give you the *facts*—entirely without cost or obligation on your part.

If your roofs are in good shape, the inspector's report will inform you. If on the other hand, repairs or reroofing are necessary, have the work done with Carey Built-Up Roofing.



Carey BUILT-UP ROOFING

Long-lasting ruggedness and durability . . . correct elasticity to withstand temperature changes . . . *finest weatherproofing protection* . . . these are some of the qualities that have made Carey Built-Up Roofs a preferred choice for thousands of industrial structures the nation over.

For literature and name of the CAREY APPROVED ROOFER nearest you, write Dept. 31.

THE PHILIP CAREY MFG. COMPANY

Dependable Products Since 1873

LOCKLAND, CINCINNATI, OHIO

In Canada: The Philip Carey Co., Ltd. Office and Factory: Lennoxville, P. Q.

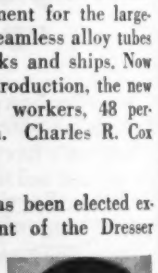
MANUFACTURERS' ACTIVITIES

R. C. CHAMBERS, formerly of Joseph Ryerson and Sons, Chicago, is the new purchasing representative in Cleveland, Ohio, for Willamette Hyster Co., Portland, Ore., and Peoria, Ill., manufacturers of tractor winches, hoists and industrial lift trucks. Offices are in the Williamson Building, Euclid Avenue.

Chambers is well known in the steel industry and as a former football notable at the University of Iowa, Iowa City, Ia.

IN PARTIAL OPERATION for several months, the huge tubular mill at Gary, Ind., was formally opened recently when 250 industrial executives and ranking Army and Navy officials made an inspection of the plant, operated for the duration by the Tubular Alloy Steel Corp., a U. S. Steel Corp. subsidiary. The new plant is in the National Tube Co. plant, built over 20 years ago and remodeled recently by the Defense Plant Corp. at a cost of $28,000,000. This work included installation of new equipment for the large-scale production of seamless alloy tubes for planes, guns, tanks and ships. Now nearing its peak in production, the new plant employs 3,700 workers, 48 percent of them women. Charles R. Cox is president.

J. B. O'CONNOR has been elected executive vice president of the Dresser Mfg. Co. Mr. O'Connor has been a director since 1938. He is also vice president and general sales manager of Clark Brothers; chairman of the board of the Pacific Pump Works; and president of Bovaird and Seyfang, all subsidiaries of Dresser. Mr. O'Connor attended the University of Georgia and served in the United States Army in the first World War. In 1919, he joined the Prairie Oil Co., and in 1923 became sales manager of the Socony Vacuum Oil Co. He



Get ready TO TACKLE THAT $3,000,000,000 Annual Paving Job!

Three billion dollars worth of paving jobs will be awarded annually to the lowest bidding contractors. You can be certain to get your share if you have Multi Foote Pavers like those that have given such impressive performance on war front construction. Their records for speed and low cost are the reasons why there are more Multi Foote Pavers in service than any other make.

Big capacity for big jobs, yet profitable to use on smaller ones too. Simple, easy operation and maintenance, speed and dependability second to none, proved superior design — these are only a few of the reasons for Multi Foote leadership. Write today for details.

THE FOOTE COMPANY, INC.

Multi Foote Pavers Conform to A. G. C. Standards and Specifications.

NUNDA • NEW YORK

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers.

y Multi Foote Pavers You All These Features

- **LE CONE DRUM** with its end- scouring action insures a com- and thorough mix of every
- **UBLE-FREE WATER SYSTEM** is ple, accurate and independent water pressure.
- **GH OPERATING PLATFORM** as- es greater visibility and faster, re accurate work.
- **TARY DISCHARGE** takes only a arter turn to kick concrete into e big bucket ready to speed out long boom to be discharged.
- **IG, WIDE, SOLID SKIP** prevents pilling and assures fast, positive charging.
- **SIMPLE, RUGGED DRIVE** provides fast, smooth action.

ARMY (E) NAVY

MULTI FOOTE CONCRETE PAVERS

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

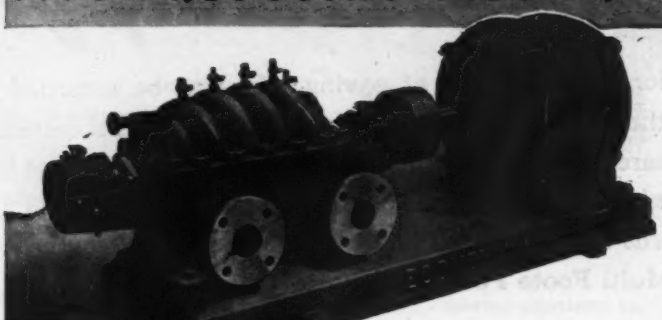
REHABILITATED WITH "GUNITE"

This is the Lower Doughty Pond Dam of the Atlantic City, N. J., Water Department, a poured concrete structure with fresh water upstream and a tide water downstream toe. Some years ago is became badly eroded, as shown by the left-hand photo. The center photo shows "GUNITE" being placed to a minimum of 6" with double reinforcing.

The right-hand view shows the finished job, completed by us in 1941. Both upstream and downstream faces were reintegrated, as well as the wing walls.
Many municipalities have saved big money by the use of "GUNITE" in their reservoirs and sewers. Read how in our Bulletin 2200. We'll send it on request.

MANUFACTURERS OF THE "CEMENT GUN"

4-STAGE PUMP CUTS CURRENT COSTS ... BY REDUCING DISC FRICTION



Economy Multi-Stage Pumps are unique in supplying high pressures at a sharp saving in operating costs. Their remarkably high efficiency is attained by dividing the total pressure into a number of low pressure stages. They are noted for the following features:

• Low head per stage • High efficiency as result of limiting head per stage • Steep characteristic curve • Flat horsepower curve which permits use of smaller motor • Lasting efficiency—lower pressure differences between sealing points

These, and many other Economy advantages, are fully described in free descriptive literature. Write for yours today.

ECONOMY PUMPS, INC.
HAMILTON, OHIO, U. S. A.

joined Clark Brothers in 1927 as eral sales manager and became president in 1935. Arthur R. Wei Lyle C. Harvey have been elected presidents.

JOHN S. CASE has been made manager of the Baltimore plant of Anchor Post Fence Co., succeeding V. W. Heggie, who resigned to enter the Navy as lieutenant commander. Before joining Anchor Post in 1936 as assistant engineer in the heating sion, Mr. Case was associated with bins and Myers, Inc., Springfield,

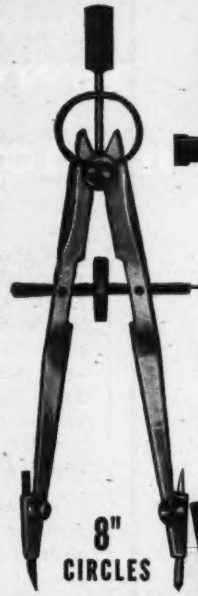
K. P. Brace, formerly with Products Division, Bendix Av Corp., and more recently with th reau of Aeronautics, U. S. Navy, h come assistant manager, aircraft e ment division.

MCCULLOCH ENGINEERING Milwaukee, Wis., is building a s engineering staff for superchargers as evidenced by the appointment of Eugene W. Wasielewski as chief engineer. Mr. Wasielewski took his master's degree in engineering mechanics at the University of Michigan. After practical field with turbines, blowers, and internal bustion engines, he became interes superchargers. When the war ga impetus to supercharging for hig tude flying, he had already behin four years of work with the Na Advisory Committee for Aeronauti design of superchargers and their tation to airplane engines. He wi rect the engineering work at McC in the further development and ap tion of superchargers to diesel gasoline engines for land and m uses.

OWING to ill health A. C. King vice president and general manag the Boston Woven Hose & Rubbe has relinquished a large part o duties, and has been appointed co tant to the president on sales p H. F. Maxon, who has been di sales manager of the New York Pennsylvania districts for the pas enteen years, has been appointed eral sales manager. W. I. Lewis, has for the past twelve years bee

DELIVERY NOW! ON THESE POST PRODUCTS

Adjustable Post Triangle
Angles quickly set anywhere from 0° to 90°. 8" transparent triangle. Secure clamping device. No. 1388..... $4.00

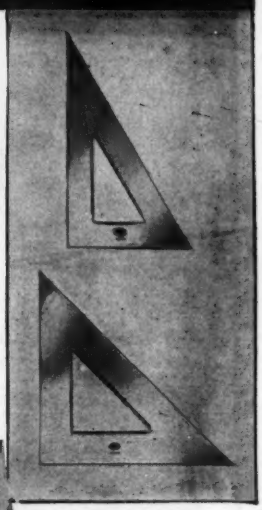


8" CIRCLES

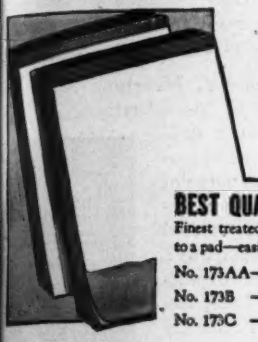
No Overhanging Edges

"BIG-BOW" PENCIL COMPASS & DIVIDER
Adjustment for circles of 8" diameter to less than 3-16". Rigidly constructed for long, accurate service. No. 9030..... $4.33

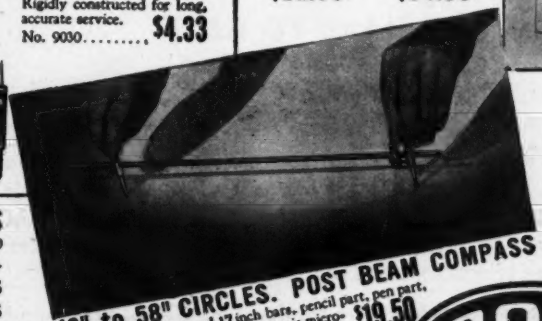
NEW POST STRAIGHT EDGES
Transparent beveled edges — both edges flush with board. Responds to slightest touch. Extra heavy.
No. 1815A—42" to 120"
$11.00 $34.00



PROFESSIONAL GRADE Transparent Triangles
Made of extra heavy, seasoned, clear polished celluloid. Inner edges beveled for finger lift.
No. 1749 (30°x60°) 6" to 18" $.50—$2.70
No. 1750 (45°) 4" to 18" $.50—$3.50



BEST QUALITY LAYOUT PADS
Finest treated tracing media. Sheets—50 to a pad—easily removed without tearing.
No. 173AA—P.T.M. 9 x 12.. $1.45
No. 173B —P.T.M. 12x18... 2.55
No. 173C —P.T.M. 18x24... 4.90



12" to 58" CIRCLES. POST BEAM COMPASS
Complete with 6, 12 and 17 inch bars, pencil part, pen part, and coupler in plush-lined case. Point is micrometer adjustable. No. 922D..... $19.50

Quick Perfect Lettering WRICO LETTERING GUIDES
For less effort and greater speed. In wide range of heights—vertical capitals, vertical numerals or both. Prices range from $2.00 for ¼" numerals to $3.10 for ½" capitals.
WRICO LETTERING SETS ALSO AVAILABLE INCLUDING PENS

Finest Tool Steel
RULING PENS
Made of finest tool steel. 6" from top of handle to tip of blade (clear plastic handle ruling pens also available).
No. 9154—6"..... $3.50
No. 9257—4¾"..... 2.15
No. 9258—5¼"..... 2.25

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Atlanta	JACK. 2121	Los Angeles	MU. 2341
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Buffalo	CLEVE. 0370	New Orleans	RAY. 0331
Chicago	KEY. 7000	New York	WIS. 7-7678
Cincinnati	MAIN 2664	Oklahoma City	3-6306
Cleveland	CHE. 7347	Omaha	ATLANTIC 7890
Columbus	MAIN 3420	Philadelphia	LOM. 7044
Dallas	RIVERSIDE 4403	Pittsburgh	ATL. 3350
Dayton	ADAMS 9174	Portland	ATWATER 8681
Denver	MAIN 5161	St. Louis	CHESTNUT 0688
Detroit	RAN. 8483	Salt Lake City	4-7823
Ft. Wayne	ANTY 4142	San Diego	FRANKLIN 1344
Fort Worth	3-3244	San Francisco	DOU. 5975
Hollywd	GRANITE 4188	Seattle	MAIN 4022
Houston	CAPITOL 1233	Tampa	M-8377
Indianapolis	MKT. 4466	Toledo	ADAMS 7224
Jacksonville	3-2166	Tulsa	3-0168
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SURE OF RESULTS

. . . You must use methods and material you can trust! You have a concrete floor. It is dusting. You have a heavy production schedule in the building which cannot be interrupted. You must dustproof and harden floors for heavy duty. You have to be SURE of results That's the time to specify LAPIDOLITH Liquid.

You'll get definite, predictable results. LAPIDOLITH Liquid requires no special skill in application. Production need not be stopped during treatment. And you can count on a hard, wear-resisting surface that won't dust. Send for your copy of "Concrete and Lapidolith Liquid." Write Dept. R-15.

BUILDING PRODUCTS DIVISION

L. SONNEBORN SONS, Inc.

88 LEXINGTON AVENUE
NEW YORK 16, N. Y.

For SURE results in hardening and dustproofing concrete floors count on

SONNEBORN'S LAPIDOLITH LIQUID

sistant to the general manager has become assistant general sales manager. W. F. Carroll, who has been resident representative in the Philadelphia district has been appointed district sales manager succeeding Mr. Maxon.

E. W. MOOREHOUSE retired as Philadelphia district manager of Atlas Powder Co.'s explosives department July 1, after 44 years of continuous service with the explosives industry. Mr. Moorehouse has been with Atlas since its organization and has been manager of the Philadelphia district offices from 1912 to 1928 and from 1931 until his retirement. From 1928 to 1931 he was general manager of Atlas' cellulose products interests. He was a member of the Board of Directors of Atlas from 1929-1934.

WILLARD V. MERRIHUE is the new manager of the advertising and sales promotion divisions of the apparatus department of the General Electric Co. He started in the company's publicity department in 1925, immediately after his graduation from the University of Pennsylvania. Latterly he had been assistant to the manager of the publicity department in charge of the apparatus division. He has been national chairman of Engineering College Magazines Associated, and is a member of the Technical Publicity Association of New York.

B. F. GOODRICH CO., has announced that work will start at once on a $2,000,000 addition to its Koroseal plant

ERIE

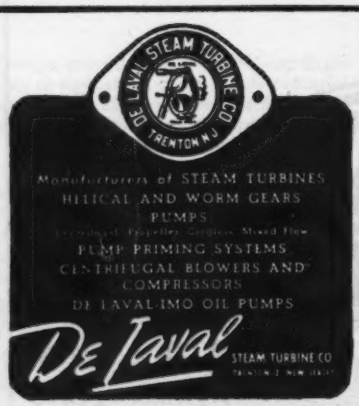
DOUBLE SUCTION
TYPE S
CENTRIFUGAL PUMPS

BELT MOTOR OR ENGINE DRIVE

Sizes From 2" to 12"

Write for Bulletin No. 38

ERIE PUMP & ENGINE WORKS
152 Glenwood Ave. Medina, N. Y.

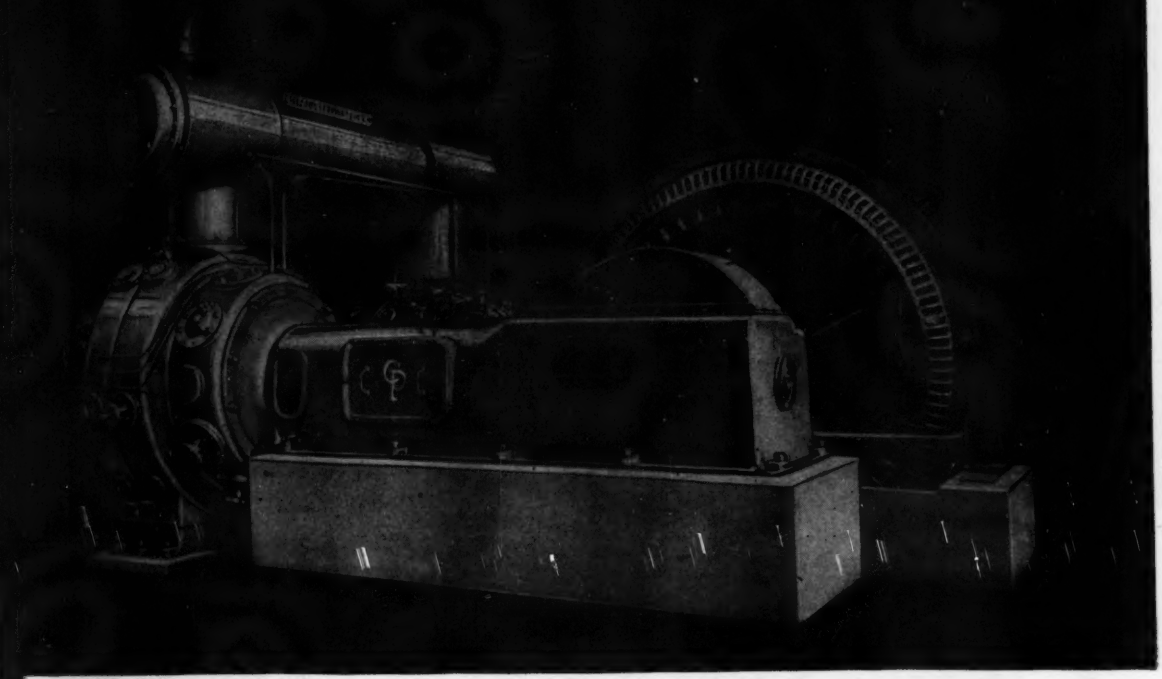


DRILLING
ANYWHERE

We look into the earth

PENNSYLVANIA DRILLING COMPANY
PITTSBURGH, PA.

Low Power Consumption



BUILT INTO CP CLASS O-CE COMPRESSOR

THE low power consumption of the heavy-duty Chicago Pneumatic Class O-CE Compressor is the result of large area, durable, quick-acting Simplate valves . . . streamlined air passages . . . multi-step capacity regulation . . . thoroughly effective intercooling and water jacketing and efficient lubrication.

CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type with direct-mounted synchronous motor drive. Capacities range from 350 c.f.m. to 10,000 c.f.m., 80 pounds to 125 pounds pressure. Other sizes available for lower and higher pressures and for other types of drive. Write for Bulletin 726.

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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

SHIPPING AIR *is a* PIPE JOB

NAYLOR LIGHT-WEIGHT PIPE GIVES
YOU AIR . . . WHERE YOU WANT IT . . . WHEN YOU WANT IT

For ventilating jobs, you won't find a better vehicle for "shipping" air than Naylor Light-weight Pipe.

This pipe with the exclusive Lockseam Spiralweld structure provides performance advantages found in no other light-weight pipe. Greater strength. Leaktightness. Safety. And along with this plus performance you get advantages in pipe line construction that speed the job, save work, reduce maintenance and effect other economies right down the line. Furthermore, Naylor enables you to use lighter gauge pipe in larger diameters and you can install it where you want it.

Sizes from 4" to 30" in diameter—thickness from 14 to 8 gauge. All types of fittings, connections and fabrication.

Naylor

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1248 EAST 92nd STREET, CHICAGO 19, ILLINOIS

NEW YORK OFFICE 350 MADISON AVENUE, NEW YORK 17, N. Y.

at Louisville, Ky. R. D. Scott, plant ... ager, says the War Production B... has ordered increased production ... resins, plastics, etc., used in produ... of cables and insulated wiring. A... 300 workers will be needed in con... tion, and about 50 additional wo... will be employed in the new additi...

DAR JOHNSON, formerly with the ... oria, Ill., Journal-Transcript as public relations and industrial promotion manager, is the sales promotion and advertising manager of the Williamette Hyster Co., Portland, Ore., and Peoria, Ill., manufacturers of heavy duty high-speed hoist e... ment for use with "Caterpillar" tra... and Hyster lift and straddle truck...

A. G. DECLERCQ, veteran of 40 ... and vice-president in charge of service and construction for the Commonwealth Edison Co., Chicago, is retiring soon. Starting as a mechanic, Mr. deClercq advanced to head of the construction department in 1918. He was made vice-... dent in 1936.

Curtis A. Lambert, an employ... the company for 38 years, succeeds Mr. deClercq. Mr. Lambert started as building inspector for the company. He advanced to the positions of building superintendent, assistant construction engineer, and in 1936 superintendent of construction. D... the past year he has served as ass... to Mr. deClercq.

C. R. DICK, vice president of the ... sissippi Valley Structural Steel Co... manager of its Decatur, Ill., plan... tired July 1. He will continue as ... president and as a member of the ... of directors and the executive co... tee. R. E. Carr, chief engineer o... Decatur plant, succeeds Mr. Di... manager there. Robert J. Wood, ... ant chief engineer of the St. ... plant, moves to Decatur to ... ceed Mr. Carr as chief engineer.

HOW AIRFIELDS GROW ON MUCK, ON SAND, ON TUNDRA

ON world-wide battle fronts America's planes are taking off on missions against the enemy—taking off from desert sand, jungle muck, or Aleutian tundra.

In a matter of days, bulldozers shove aside the muck or level the sand. And giant cranes lay steel landing mats that are bolted into a landing strip.

Look at the engines in these bulldozers and cranes. You'll find familiar friends—the same friends that power tanks and trucks, landing barges and patrol vessels, tractors and auxiliaries—General Motors Diesels.

And in these rigorous jobs of war, a promise is being written—a promise of plentiful, dependable, easily maintained, low-cost power for America's needs in the peacetime days ahead.

Tomorrow

Reconstruction and new construction are going to need plenty of this hard-hitting, easy-on-the-fuel power. With normal refinement and development speeded up by war, with production expanded, GM Diesels will be ready to serve in more fields and in more ways than ever.

GM
GENERAL MOTORS
DIESEL POWER

ENGINES...15 to 250 H.P.... DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

ENGINES...150 to 2000 H.P.....CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES.....ELECTRO-MOTIVE DIVISION, La Grange, Ill.

SLINGS CAN'T SLIP OFF!

Laughlin Safety Hooks have a unique latch designed to prevent loads from slipping or jolting off the hook. Green workers can work with less fear of accidents . . . older hands will appreciate this safety feature. Laughlin's Safety Hooks are made of heat-treated, drop-forged steel.

OTHER LAUGHLIN FITTINGS

Laughlin offers you the most complete line of hoist hooks on the market, and there are standard Laughlin fittings for almost any other requirement.

ROPE SOCKETS

Rope sockets of drop-forged steel are available in sizes ¼" to 1¾" (open pattern) and sizes ¼" to 1¾" (closed pattern), plain or galvanized finish.

WELDLESS TURNBUCKLES

Weldless Turnbuckles are available in all types and sizes from ¼" x 4" to 2½" x 36". The largest turnbuckle ever made by drop-forging was produced by Laughlin . . . a giant of 440 pounds for a 50 ton boom.

Laughlin's latest catalog shows the complete line of Laughlin Wire Rope Fittings. Send for it.

Distributed through
Mill, Mine, and Oil Field Supply Houses
Look for Laughlin Products in
Power's Road & Street Catalog

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE

Knorr, formerly assistant treasurer and assistant secretary, has been elected treasurer. A. H. Bennett, chief accountant, will assume additional duties, and has been elected assistant secretary.

ANNOUNCEMENT has been made of the incorporation at Cleveland, Ohio, on May 31, of the Truckstell Manufacturing Co.—a stockholder distributor organization consisting of approximately 40 national distributors of truck equipment.

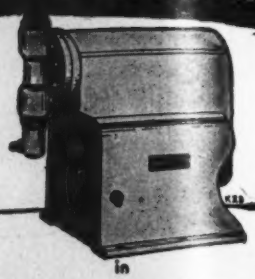
This will enable this group with established organizations throughout the country, to coordinate and intensify activities. The step will also provide better facilities for standardized products to meet the needs of a greater number of truck operators at less cost.

Donald W. Meyer is president of the new company and J. D. Maynard of Detroit; C. A. Bieber of Cleveland and Walter Blaul of Chicago are vice-presidents F. J. Hessler of Cleveland is secretary-treasurer. Milton W. Anderson is chairman of the board, which consists of: Mr. Meyer and L. N. Ross of Portland, Ore.; M. J. Neeley of Fort Worth, Tex.; Neil Schilling of Memphis, Tenn.; John Groenier of Chicago, Ill.; J. D. Maynard of Detroit, Mich.; L. Howard Wilcox of Pittsburgh, Pa.; S. C. Olson of Minneapolis, Minn.; C. H. Smyth of Boston, Mass.; and W. J. Boggs of Kansas City, Mo.

JACK E. GOULD has been appointed general superintendent of the Gary, Ind., plant of the Tubular Alloy Steel Corp., a U. S. Steel Corp. subsidiary, according to Leo J. Mason, vice president of Tubular Alloy. After getting his master's degree in metallurgical engineering at the University of Michigan in 1930, Gould joined the U. S. Steel Corp. subsidiary, the National Tube Co. In 1934 he was promoted to superintendent of the metallurgical department. From 1943 until his recent promotion he served as assistant vice president in charge of operations in the Pittsburgh office of National Tube.

POSTWAR ENTRY of Fairbanks, Morse & Co. into the railroad locomotive industry was announced recently by company officials. Freight, passenger and switch locomotives will be built at the company's Beloit, Wis., plant. They will be powered by diesel engines. All diesel engines to be built by Fairbanks-Morse for its locomotives will be of the type

. . . for ACCURACY and TROUBLE-FREE OPERATION



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WATER & SEWAGE TREATMENT
and in
CHEMICAL PROPORTIONING
for Processing Industries.

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Literature on Request

Engineered and Manufactured by
WILSON
CHEMICAL FEEDERS, INC
213 CLINTON ST. • EST. 1923 • BUFFALO 4, N. Y.

Shunk
Superior Quality
BLADES
AND CUTTING EDGES

For any make of machine
Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

CUTTING EDGES
WEARING BOOTS
BACK SLOPERS
EXTENSION BLADES
MOLDBOARDS
and
SCARIFIER TEETH

50 years of manufacturing blades has developed for you a special steel, milled through our own rolls and forged at the edges to give that extra wearing quality you need.

All widths lengths, and thicknesses. PUNCHED ready to fit your machine.

Consult your internationally recognized Blade Specialists. Write for special bulletins, giving type and name of machines you operate—get set for Blades equity.

Shunk
MANUFACTURING COMPANY
Established 1858
BUCYRUS, OHIO.

Stockpiling

Labor saving equipment is of the utmost necessity now and in the immediate months to come. To meet this need, WPB has released a limited schedule of Barber-Greene Model 82-A Bucket Loaders and Wheel Mounted and Permanent Belt Conveyors.

Preparation of aggregate and stock piling sized material is greatly facilitated with Barber-Greene Permanent and Portable Belt Conveyors. Reclaiming from stock piles is speeded up using the high capacity Model 82-A Bucket Loader, requiring less idle truck time. Often truck drivers easily fill in as loader operators loading their own trucks.

Barber-Greene engineers can assist you in utilizing your present equipment to its fullest advantage, as well as suggesting new equipment if it is necessary. Write to Sales Engineering Department, Barber-Greene Company, Aurora, Illinois, U.S.A.

44-24

BARBER-GREENE

AURORA ILL

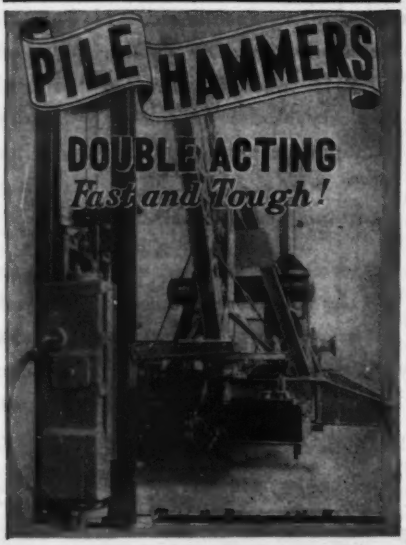
NEED A POWER GRADER?

WARCO

has some available, subject to prior releases or Government requirements. Can ship promptly upon receipt of order with WPB-1319 Release.

W. A. RIDDELL CORPORATION
Bucyrus — Ohio

UNION



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ELIZABETH, New Jersey

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Foundation Test Borings
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Determination of Extent and Quality of Coal Beds
Depth and nature of overburden, preliminary to stripping operations
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Rugged Portable Equipment
Simple to operate
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Acker Drill Company
Scranton 3, Penna.

in which two pistons move in opp directions within each cylinder.

Developed over the past 10 years, opposed-piston type diesel engine claimed to develop twice the power the same amount of space as is acc plished in standard diesel engines. first of the new Fairbanks-Morse die electric locomotives is scheduled for livery late this year.

John W. Barriger, III, has been pointed manager of the company's ne created diesel locomotive division.

A graduate of Massachusetts Institute of Technology in 1921, Mr. Barriger first served with the Pennsylvania R.R. in its maintenance of ways and transportation department. In 1933 he was placed in cha of the railroad division of RFC, resi ing in 1941 to become associated w the Carriers' Conference Committee the 1941 railway wage case, after wh he returned to Washington as an as ciate director of ODT, later resigning become associated again with the C riers' Conference Committee in the 19 wage case, and to become vice pre dent of the Union Stock Yard and Tra sit Co., of Chicago.

Mr. Barriger served as a reorgani tion manager of the Chicago & East Illinois R.R. during 1940, becoming member of its board and executive co mittee the following year and retir from those offices in 1942. Subsequent he became a director of the Alton R

Under Barriger's management, Fa banks-Morse will manufacture freig passenger and dual-service locomoti in standardized units, each powered a single diesel engine.

JOSEPH MCCLINTOCK GARRIS, 72, di May 25. He was known for his lead ship in promoting safety in materials-handling. Mr. Garris held several basic patents, notable among them a braided wire rope sling, manufactured by Macwhyte Co., Kenosha, Wis.

He joined Macwhyte in 1931, and since then has be manager of the sling division. His s Erwin F. Garris, also widely know has been his assistant and will car on in the footsteps of his father.

W. O. EVERLING has been appoint

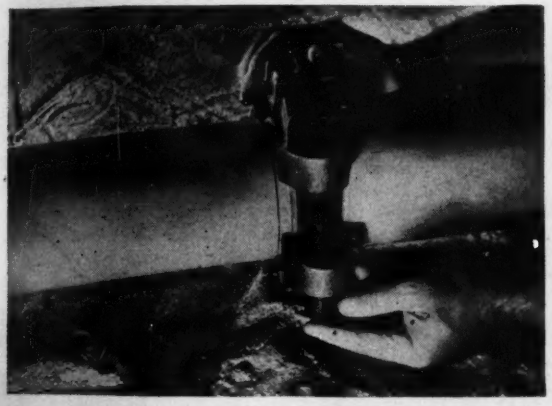
How to make a Leak-tight Pipe Joint . . . FAST!

There's one sure way that eliminates all guesswork. It takes no special skill or training. It calls for no special equipment . . . only one small wrench is required. All you need is standard grooved pipe . . . and Victaulic Couplings. Here's what you do . . .

1 Your Victaulic Coupling is simple, fool-proof . . . a single gasket, two half-housings and two bolts only. Spread 'em out.

2 Slip gasket over one pipe and bring pipe ends together. (Don't worry about accurate alignment . . . the Victaulic Coupling permits angular deflection.)

3 Slide gasket into central position over pipe ends. (You're working up to a leak-tight, self-sealing joint . . . for either pressure or vacuum.)



4 Put on housings and insert bolts. You'll be surprised how little time you've taken until now.

5 Turn down the nuts until housings come together. That's all there is! And at each joint you have flexibility, expansion, a union, and a sure, safe lock . . . faster than you'd have thought possible!

BUY MORE WAR BONDS

VICTAULIC

Reg. U. S. Pat. Off.

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

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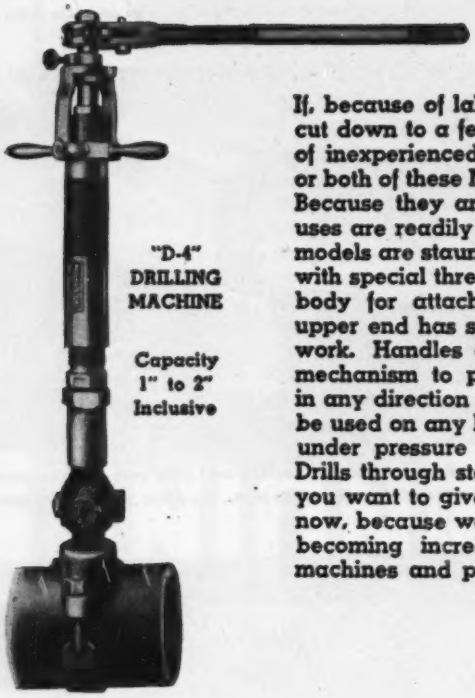
NEW VICTAULIC CATALOG MANUAL

. . . a must for every firm that uses pipe. Contains all you need know about Victaulic Couplings and Full-Flow Fittings. Write to nearest address for your copy today on your firm's letterhead. Victaulic Company of America, 30 Rockefeller Plaza, New York 20, N. Y.; Victaulic Inc., 727 West 7th St., Los Angeles 14, Calif.; Victaulic Co. of Canada, Ltd., 200 Bay Street, Toronto.

NEED A DRILLING MACHINE?

here it is!



"D-4" DRILLING MACHINE

Capacity 1" to 2" Inclusive

If, because of labor shortages, your force is cut down to a few skilled men and a bunch of inexperienced workers you can use one or both of these MUELLER Drilling Machines. Because they are simple in operation their uses are readily learned by new men. Both models are staunchly built. Each is designed with special threads on the lower end of the body for attaching adapter nipples. The upper end has special packing for pressure work. Handles are placed above the feed mechanism to permit their free movement in any direction and in close quarters. May be used on any kind or size of main—dry or under pressure up to 100 lbs. per sq. in. Drills through stops, valves, or fittings. . . If you want to give your men the best—order now, because war needs come first and it is becoming increasingly difficult to supply machines and parts.

LOAN YOUR MONEY TO UNCLE SAM . . . YOU CAN'T LOSE

Buy a War Bond Today

"E-4" DRILLING MACHINE

Capacity 7/16" to 1" Inclusive

FOUNDED 1857

MUELLER CO.

DECATUR 70, ILL.
LOS ANGELES 1, CALIF.

director of research of the American Steel & Wire Co., U. S. Steel subsidiary, succeeding the late J. S. Richards. R. H. Barnes has been named assistant director of research to replace Mr. Everling, whose first association with the U. S. Steel Corp. was in 1927 as a draftsman for the Carnegie Steel Co. He joined the American Steel & Wire Co. in 1930 and advanced through several positions to assistant director of research in 1940. Mr. Barnes has worked for American Steel & Wire Co. since 1920.

GEORGE M. CARVLIN has been elected vice president of Koppers Co., engineering and construction division, Pittsburgh, Pa. He has been an assistant to Joseph Becker, vice president and general manager of the division, since 1940.

RAY MORSE, for 11 years manager of the Los Angeles Wire Rope Department of Wickwire Spencer Steel Co. has been appointed sales manager of the Wood Manufacturing Co., Los Angeles, manufacturers of a travel plant method of pavement construction. Widely known by equipment distributors and dealers throughout the southwest, Morse will concentrate on establishing dealerships for the Wood Roadmixer.

THE WOODWARD IRON CO., Woodward, Ala., has opened a general sales office in the First National Bank Building, Birmingham, with John B. DeWolfe, vice president, in charge. Mr. DeWolf was formerly associated with the sales departments of Jones & Laughlin Steel Co. and Republic Steel Corp. He went with the Woodward Co. in March, 1944, when he was elected a vice president.

WILLIAM W. EGE, is general manager of sales of the Copperweld Steel Co., Glassport, Pa. He announces the appointment of Mr. A. R. Teifeld as advertising manager. Mr. Teifeld was formerly with the American Steel & Wire Co. of Cleveland, Ohio, with whom he was connected for about 21 years. His last assignment covered the supervision of that company's electrical, wire rope and construction mate-

WEATHER-PROOFED DYNAMITE

SUDDEN WETTING or prolonged exposure to water won't damage Du Pont Special Gelatin. It's weather-proofed.

Here's a dynamite designed to take things in its stride. It's a general-purpose gelatin dynamite that can be depended upon to "deliver the goods" under the most adverse conditions. Water-filled holes are no obstacle.

A powerful, high-velocity dynamite with strong shattering action, Du Pont Special Gelatin has outstanding qualities which make it a favorite everywhere. It is plastic, cohesive, dense, water-resistant.

And due to its plasticity, you can load a heavier charge of Special Gelatin in a given space . . . the charge can be concentrated in the end of the bore hole . . . where it is needed most.

Small wonder that hundreds of contractors are making Du Pont Special Gelatin their general-purpose dynamite. They appreciate its adaptability and dependable performance. For full details, talk with your Du Pont Explosives Department representative or write for further information. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware.

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DU PONT EXPLOSIVES

Blasting Supplies and Accessories

Smith Powerful Compressors

make friends everywhere

Big, husky,-yes, powerful enough for a majority of your compressor work! And, remember, when you use a Smith you use only 1 gal. of gasoline an hour!

Low initial and operating cost. Parts available the country over as Smiths use **FORD MOTORS AND STANDARD PARTS.** Capacity easily varied for different jobs. Automatic unloading and idling; self-starter; no couplings, belts, clutches or gears to cause trouble.

With a Ford Motor and Shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free Booklet

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INCORPORATED
430 College St., Bowling Green, Ky.

rials advertising. Mr. Teifeld will make his headquarters at Glassport, in the Pittsburgh industrial district.

AT CLEWISTON, FLA., more than eight miles of cast iron pipe will be used to supply water for an immense starch house under construction by the U. S. Sugar Corp. Four lanes of pipe extend from the 3-mile long overland pipeline under a canal and into Lake Okeechobee. To get pure water, to be used at a rate of one million gph., one line will extend five miles into the lake. Water pumped from the lake will be stored temporarily in a 250,000 gal. tank.

Sweet potatoes will be turned into starch at this $7,000,000 plant. The enterprise will form a new source of starch needed in war industries and will give the Everglades district a new crop.

BERNARD E. GRAY, general manager of The Asphalt Institute, has announced that the southwest division has appointed A. J. Kavanaugh as district engineer for Oklahoma and New Mexico, with office in the Petroleum Building, Oklahoma City, Okla.

Mr. Kavanaugh's engineering experience includes designing and construction work in Oklahoma during the past thirteen years. For the past five years he has been Secretary-Manager of the Oklahoma Good Roads Association. He is equipped to extend the engineering research, and promotional facilities of the institute to highway engineers and contractors.

GEORGE R. FINK president of Great Lakes Steel Corp., has appointed Paul T. Farrell, now director of purchases for Great Lakes, to the new position of assistant to the president, Stran-Steel Division, headquarters, Washington, D. C. Farrell has been with the Great Lakes organization since its formation in 1929.

CREATION of a new Allis-Chalmers research and gas turbine development division has been announced by R. C. Allen, manager of the steam turbine department. J. T. Rettaliata has been appointed manager. While all steam turbine design and engineering research will be conducted by the new division, its most significant role will be the development of the gas turbine.

Dr. Rettaliata, who received his degree of doctor of engineering at Johns-Hopkins in 1936, will be assisted by J. L. Ray, chief engineer in gas turbine development.

SAVE TIME

With a "BERG" SURFACER

"BERG" Model A-G2

This speedy surfacer is portable and consists of engine unit (gasoline-one cylinder, air cooled) flexible shaft, casing and head. The cutter plate and carbo discs are accurately made. It is ideal to use practically anywhere—saves time and labor on many jobs.

Write now for more complete details. You won't be obligated.

Pioneers in Concrete Surfacing Machinery

THE CONCRETE SURFACING MACHINERY CO.
CINCINNATI OHIO

When There's No Time for Breakdowns It's Time to Get a Gorman-Rupp Pump

Today, when time is the essence, you need a Gorman-Rupp Self-Priming Centrifugal Pump more than ever. There is not a quitter among them. The water passage has the same area as the suction hose. Muck, gravel, cinders—you simply can't clog them because solids cannot accumulate. There is no recirculation orifice to clog—no shut-off valve to jam—no hand priming required. There isn't a self-priming centrifugal pump made that will outwork a Gorman-Rupp in gallonage or continuous hours. Gas engine or electric motor driven. Capacities up to 120,000 GPH. There is a type and style to fit your every requirement. Stocked for immediate delivery in 100 principal cities.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio

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Self-Priming Centrifugal Pumps

"No discharge from the war" —for trucks, buses, taxis!

AMERICA expects every truck, bus and taxi you own, operate or maintain to do its full duty on the home front; until the last gun is fired. The slogan is—*keep 'em rolling!*

Quaker State HD Oil is playing a big part in keeping them *rolling.*

Because it not only assures lubrication that really does a job, and is extra long-lasting—but because it contains a wonderful new detergent, it actually cuts out and *keeps* out carbon, gum and sludge. Try QUAKER STATE HD OIL—*"It's the OIL that Carries the Load."*

Quaker State HD Oil
for your trucks, buses and tractors

Quaker State Motor Oil
for your passenger cars

QUAKER STATE
HD OIL
AND QUAKER STATE SUPERFINE LUBRICANTS

QUAKER STATE OIL REFINING CORPORATION • OIL CITY, PA.

3 REASONS for Using Standard Twin Disc Clutches!

1. By specializing in clutch manufacture the clutch specialist is able to combine the economies of volume production with the maximum in performance and wear-life qualities.

2. By eliminating the use of "Specials" you assure complete replacement parts stocks with a moderate investment. Thus the clutch specialist is prepared to give you the best of service . . . supply needed parts at moderate prices.

3. By working closely with the designer of engines and material handling equipment the Twin Disc Clutch Company has developed a varied line of friction clutches which meets every need. Their record of performance in the construction field is your assurance of uniformity and adequate wear-life.

That's why, in the designing of a new piece of equipment, you'll find it to your advantage to use *Standard* Twin Disc Clutches. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

NEW TRADE PUBLICATIONS

Treated Mine Ties—An 8-page booklet tells about a creosote pressure-treated oak base to which is fitted a Bethlehem steel mine tie secured with special nuts and bolts. Particularly advantageous where expensive mechanical cutting and hauling machines are used, these ties combine the benefits of treated wood and steel ties in one unit to provide high-capacity track to match high-capacity equipment.—*Koppers Wood Preserving Division, Pittsburgh* 19, Pa.

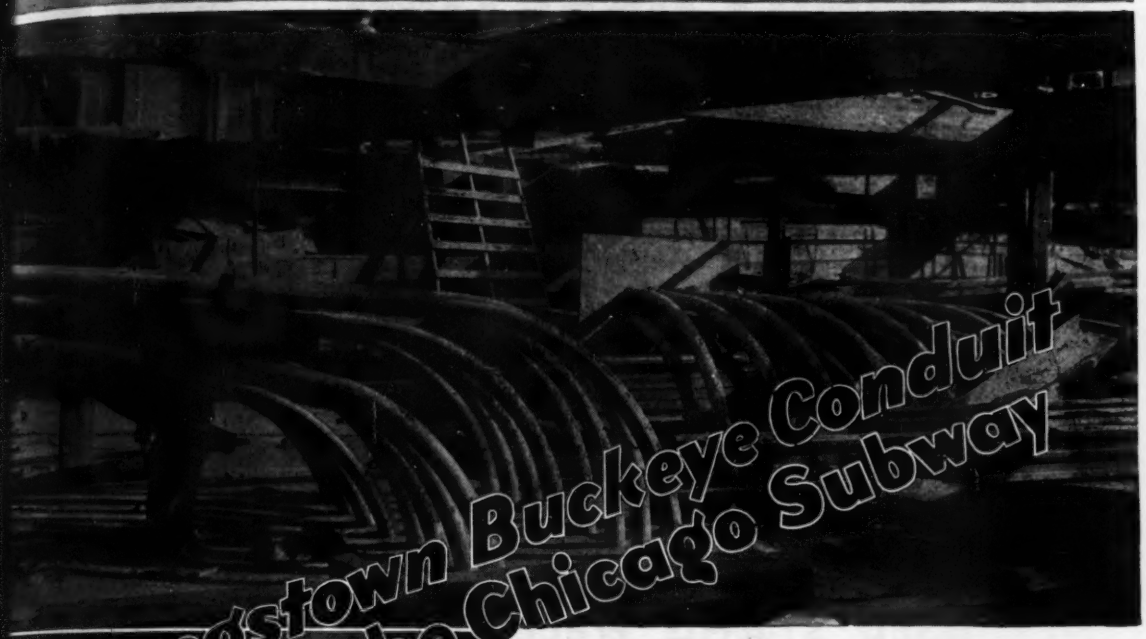
D-C Motor Controls—A 4-page, 2-color technical bulletin describes electronic, adjustable speed motor drives which operate any d-c. shunt-wound ½ hp. to 15 hp. motors from a-c power supply for driving lathes, grinders, drill presses, conveyors, winches, printing presses, etc.—*Weltronic Company, Detroit* 19, *Mich.*

Crane Stability Gage—An illustrated bulletin describes a device to protect boom-type cranes and similar equipment from overturning or failure due to excessive loads, by measuring accurately and continuously the stability of the equipment so that the operator always knows his margin of safety.—*General Electric Co., Schenectady, N. Y.*

Power Job Equipment—A 20-page booklet illustrates a complete line of diesel engines, tractors, and road machinery for earthmoving, agriculture, logging, mining, oil field, and other power jobs, tilling the soil, harvesting crops, moving earth, powering textile mills, mines, village power plants, sawmills, service stations, boats, and buildings, and maintaining roads.—*Caterpillar Tractor Co., Peoria, Ill.*

Truck Driver's Manual—This manufacturer has issued a handbook offering information applicable to all makes of trucks. Illustrated with sketches and photographs, it devotes 158 pages to things the driver should know. It is meant also for truck owners and fleet superintendents. It covers the requirements of correct preparation, starting,

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



ONLY the sure, lasting protection of full-weight, rigid steel conduit is good enough for the wiring of the new Chicago Subway. This job took over a million feet of Youngstown Buckeye Conduit.

Wherever a wiring system needs adequate protection against water or moisture or vapors, dust and dirt, vibration and possible explosions, there is no dependable substitute for steel conduit. This fact is recognized in the National Electrical Code.

For years, owners, contractors and dealers have depended on Youngstown Buckeye Conduit--knowing that it provides the best and cheapest insurance against hazards, trouble and expense.

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CARBON . ALLOY AND YOLOY STEELS

Ask your distributor for Youngstown Buckeye Conduit . . . Pipe and Tubular Products . . . Sheets . . . Plates . . . Electrolytic Tin Plate . . . Coke Tin Plate . . . Bars . . . Rods . . . Wire . . . Nails . . . Tie Plates and Spikes

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THEY USED STANG WELLPOINTS THE JOB WAS

STANG-DRIED!

Talk about saving time and money! You can imagine what a steel cofferdam would have cost on the above job. Photo shows STANG WELLPOINTS at —10′ and —28′. Original water level was at plus 7. STANG dewatered the site fast and safely—the steep banks stood firm—and the contractor's bank account stayed put, too! Have YOU a job-drying problem? Just remember this—large jobs or small—STANG DRIES THEM ALL.

JOHN W. STANG CORP.

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taking-off, road practices, parking, care, and supplies an appendix con ing valuable reference data.—*The Motor Co., Cleveland 1, Ohio.*

Oil Reclaimer—A bulletin desc units said to be capable of restorin kinds of lubricating, hydraulic, cu and vacuum pump oils so that th claimed oil can be re-used just as oil. Operators of diesel engines ca a single unit to take care of all engines, removing fuel dilution moisture and keeping engines c Capacities range from 4 to 300 g *The Youngstown Miller Co., Sand Ohio.*

Steel Windows and Doors—Ma the items described in this catalo temporarily unavailable except limited number of priority uses. ever, the information will be he for postwar planning as all the items will again be available as soo wartime restrictions are lifted.— *William Bayley Co., Springfield, Oh*

Welding Fittings and Flanges— mensional data chart gives quick l information on every welding fittin flange. Printed attractively in colors, these 9x24 in. charts are for spreading out on a drawing boa desk, or they can be folded into a 9 4 in. pocket folder.—*Tube Turns, Louisville, Ky.*

Water Cooling—A booklet, "Fu mentals of Water Cooling," should industrial users of water for cooling poses a better understanding of th gineering principles involved and best practice in the selection, app tion, operation and maintenance of type of water cooling equipment. producers believe that this is the time that the theory and practic water cooling engineering has given such thorough yet conde treatment or such extensive illustr to make each point clear. The inte was that it should serve as a refre

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Airco No. 1 Alloy Steel Rod

Developed especially for gas welding of steel plate and pipe comparable to Grade A and Grade B pipe analyses. Outstanding among its features are the high ductility of deposits, smooth flowing qualities, and resistance to heating. Five sizes from 1/16" to 1/4"—36" lengths.

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A smooth flowing, copper-coated rod of dependable, uniform quality for general gas welding of steel plates, sheets, pipe, etc. Seven sizes from 1/32" to 1/4"—36" lengths.

Airco No. 9 Cast Iron Rod

A very high quality cast iron rod, free from sand or scale. It flows freely and produces clean, sound, soft machineable welds. Sizes, 3/16", 1/4", 3/8" in 24" lengths and 1/8" in 18" length.

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A complete line of alloys for building up wearing surfaces by oxy-acetylene flame and electric arc welding. These alloys are furnished in types to meet every service condition.

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This handy booklet gives full details on Airco's comprehensive line of accessories for every gas and arc welding need. Rods, fluxes, brazing alloys, hose, goggles, gloves, and many other welding essentials are listed with prices, sizes, and shipping details. Mail the coupon for your free copy.

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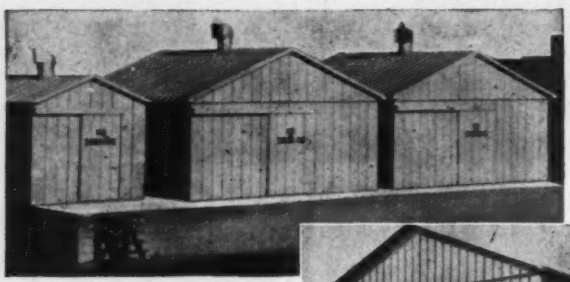
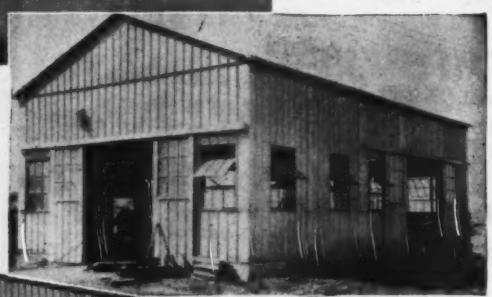
SAVE TIME AND MONEY—Whether you need a small tool shed, a medium-sized warehouse or a large factory building. Mesker can assemble the material from large stocks of standardized steel parts—and you'll have your completed building immediately and at unbelievably low cost! Widths of clear-span buildings are standardized in intervals of 2 feet up to 60 feet, and in intervals of 10 feet from 60 feet to 100 feet. Any required width can be furnished in multi-gable structures. Mesker "Packaged Buildings" can be erected and in use weeks before other types of buildings.

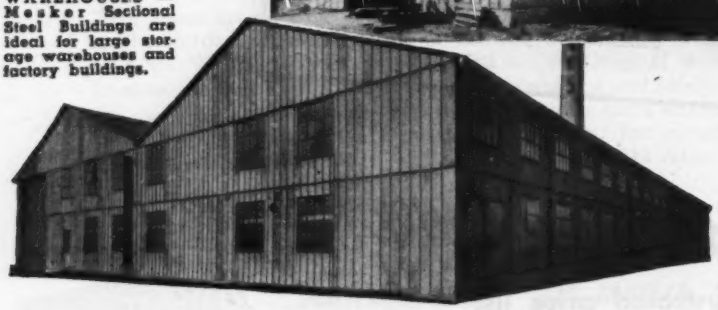


GAS STORAGE BUILDINGS — Used by leading manufacturers of Bottled Gas for storage in small communities.



MACHINE SHOP — An ideal building for mines and factories for maintenance purposes.

WAREHOUSES — Mesker Sectional Steel Buildings are ideal for large storage warehouses and factory buildings.



Mesker standardized sectional steel buildings are designed for attractive appearance as well as practical durability. The rust-resistant, painted structural steel framework is covered with pressed galvanized steel sheeting, which requires no paint. A unique ridge cap, eaves and gable trim properly finish off these structures. Doors and windows are of steel. No other type of building combines all the advantages of Mesker Standardized Steel Buildings:

. . . Fire Resistant . . . Low First Cost . . . Immediate Shipment . . . Easily Erected . . . Attractive Appearance . . . Low Maintenance . . . Low Insurance . . . Long Life . . . Easily Altered . . . Readily Movable.

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course for college-trained engineers and as a practical working reference for non-technical men, in both cases bringing the reader abreast of latest trends in the field.—*The Marley Co., Kansas City, Kan.*

Apartment Heating Control—A comprehensive manual, including blueprints of typical installations for steam and hot water heating systems, and accompanied by technical data has been prepared. Incorporated are eight of the prize winning designs of a recent $10,000 competition. These illustrate various solutions of problems of apartment heating. According to surveys of apartment dwellers, owners and operators, individual apartment heating control promises to become an important factor in maintaining high occupancy rates when construction of apartment houses can be renewed on a normal basis.—*Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

Degreaser—A bulletin describes special temperature controls for degreasing and other metal cleaning machines. Simple, self-operated controls for both heating and cooling are said to maintain vapor lines on degreasers within narrow limits. At the same time they effect substantial savings in solvent and water. The bulletin includes installation details, capacity tables, and other engineering data.—*Sarco Company, Inc.* 475 *Fifth Avenue, New York* 17, *N. Y.*

Fuel Conservation—A book produced cooperatively by the manufacturers of automatic controls indicates the purpose and application of the various types of controls in relation to our big national fuel conservation job. Entirely non-promotional in nature, the manual treats its subject from the educational and practical approach. It is a valuable book for anyone interested in the heating or maintenance of buildings other than family homes.—*The Fuel Conservation Council for War,* 500 *W. Oklahoma Avenue, Wilwaukee* 8, *Wis.*

Weld Testing Machine—A booklet describes a new portable weld testing machine. The two outstanding advantages of this machine stressed by the manufacturers are, first, its ability to provide accurate data on tensile strength and ductility of weld specimens; and secondly, its relatively light weight, which enables users to perform weld tests right on the job. It is useful for firms doing extensive work on installations, construction, and similar jobs in remote locations. The machine operates on the principle of the hydraulic jack. A hand-operated pump transmits pressure through a hose to the plunger. While the maximum direct load is 40,

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WAR BONDS...TO HAVE AND TO HOLD!

CONSTRUCTION activities on the vital home front require thousands of Dodge Job-Rated trucks for dependable transportation facilities.

TODAY, when transportation is so vital and essential, hundreds of thousands of Dodge truck owners are learning that "it's a long, long way to the last mile . . . of a dependable Dodge." They are also learning the reason *why* . . . that when trucks *fit* the job, they do a *better* job . . . they're more economical, and they *last longer!*

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More than 300,000 Dodge-built Army trucks are serving the United Nations.

DODGE *Job-Rated* TRUCKS

SEE YOUR DODGE DEALER...NOW! The Government has authorized the production of a limited number of new Dodge *Job-Rated* trucks for civilian use in essential hauling. If wartime regulations permit you to buy, see your Dodge dealer for trucks to fit *your* job. See him, too, for dependable service by factory-trained mechanics using factory-engineered parts.

,000 U.S. COMMUNITIES DEPEND ENTIRELY ON MOTOR VEHICLES FOR TRANSPORTATION

25 Yards at a Time . . .

● That's the way the Northern Illinois Coal Corporation—one of the nation's larger coal strippers—removes overburden from its fields near Wilmington, Illinois. Having achieved outstanding results with Page Automatic Dragline buckets, this Midwest firm has now standardized on Automatics and has in use 5, 8, 12, 14 and two 25 cubic yard Page buckets, one of which is shown above.

These giant Automatic buckets proved more than a match for extra-tough overburden sometimes in excess of 80 feet deep, and produced yardage 'way beyond what was thought to be dragline possibilities with greatly reduced maintenance and operating costs.

PAGE

Automatic **DRAGLINE BUCKETS**

PAGE ENGINEERING COMPANY, CHICAGO 38, ILL.

000 lb., the use of reduced section s
mens permits tests on metals of 15
psi. or higher tensile strength.—*Air
duction Sales Co., 60 East 42nd St
New York 17, N. Y.*

Conservation Welding—Full of
able ideas on how welding can be
to cut replacement costs is an info
tive bulletin titled "Conservation W
ing." Suggestions cover the repai
tractor sprockets, manganese
crusher mantles, clamshell bucket t
crusher liner segments, manganese
rock hammers, crusher liner segm
conveyor screws, pusher shoes,
While in normal times it is occasion
cheaper to scrap a worn part, in t
days of metal shortages, the welding
is said to be a valuable friend in nee
*American Manganese Steel Divisi
the American Brake Shoe Co., Chi
Heights, Ill.*

Crushing and Screening Plants
handsome 40-page illustrated boo
describes the manufacture and use
complete line of crushing and scree
plants, asphalt plants and material
dling equipment. The company emp
over 1,800 persons in the entire pro
of foundry, structural work, machi
and assembly. The account of the e
neering department is especially in
esting.—*Iowa Manufacturing Co., C
Rapids, Ia.*

Tangent Bender—This booklet
how many types of new streamli
steel equipment can be produced be
and more economically with a tan
bender. Among these are: refriger
cases, kitchen cabinets, stoves, bo
metal furniture, bathroom equipm
airplane and automobile parts.—*Str
ers Wells Corp., Titusville, Pa.*

Plywood for Homes—Elaborately
lustrated with full-color reproducti
of wood-walled rooms, this brochur
part of a joint campaign by the
largest plywood concerns to build pu
appreciation of their products. Desc

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Pressure Formed
90% Open Area
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STAGE SECTIONAL
PRESSURE GROUTING
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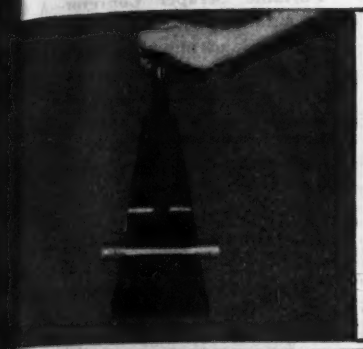
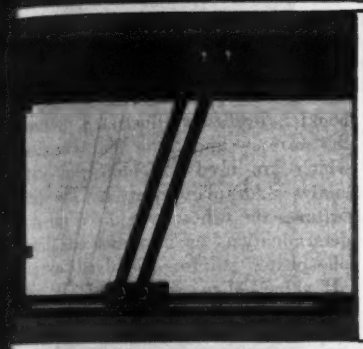
MOTT CORE DRILLING CO
HUNTINGTON, W. VA.

3 helpful time-savers for the LABORATORY



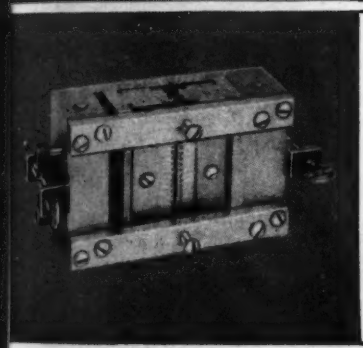
1. GAGE POINT PUNCH

Time-Saver No. 1 . . . automatically centers either round or flat specimens. Marks four uniform 2-inch gage-length centers with one push of the handle. Automatically adjustable to suit soft or hard materials. Accommodates rounds ⅛" to ¾" dia.; flats ½" to ¾" wide and zero to ¾" thick.



2. PARALLEL RULER

Time-Saver No. 2. This parallel ruler assembly facilitates and simplifies the rapid determination of yield strength, and data from stress-strain curve.



3. EDGE-COMPRESSION TESTING JIG

Time-Saver No. 3. This simple inexpensive new jig permits direct determination of compression yield strength from a single test sheet, rather than use of a pack. Simplifies testing technique.

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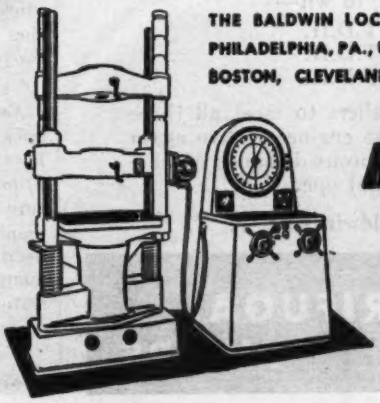
Hydraulic presses, Testing equipment, Steel forgings and castings, Diesel-electric locomotives, Diesel engines, Metal plate fabrication, Rolled steel rings, Bronze castings, Heavy machine work, Crane wheels, Bending rolls, Plate planers, Babbitt metal, Alloy iron castings, Briquetting presses.



THE BALDWIN LOCOMOTIVE WORKS, BALDWIN SOUTHWARK DIVISION, PHILADELPHIA, PA., U.S.A. OFFICES: PHILADELPHIA, NEW YORK, WASHINGTON, BOSTON, CLEVELAND, CHICAGO, ST. LOUIS, HOUSTON, SAN FRANCISCO

BALDWIN

SOUTHWARK

TESTING EQUIPMENT

...WITHOUT OVERLOADING THE MOTOR

That's the range which Morris engineers have combined in this 2-stage, double-suction, series pump.

Three distinct delivery volumes . . . three distinct heads . . . and a top head of 180 feet per impeller!

Maybe you've imagined this couldn't be done without varying the speed and horsepower of the motor. But Morris engineers have turned the trick with a skillful impeller design in a 2-stage, double-suction, series type pump, with 6" suction and 6" discharge. Originally created as a booster pump for an important United States Army water supply, its impellers are so designed that the direct-connected 100 hp., 1760 rpm. motor is not overloaded at the maximum capacity, and yet the delivery is good at the higher pressures, to wit—

500 G.P.M. at 360 ft. T.D.H.
1000 G.P.M. at 300 ft. T.D.H.
1500 G.P.M. at 140 ft. T.D.H.

By accurately proportioning the impellers to meet all three performance conditions, Morris hydraulic engineers have again proved their ability to meet the most rigorous demands of wartime use, or reliable, economical municipal operation.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

MORRIS CENTRIFUGAL PUMPS

tion and illustration of various kinds of plywood, together with room designs by prominent architects, are contained in the brochure. Stressed is the fact that the products are guaranteed for the life of any home in which installed, with economy of installation and virtual absence of maintenance expense.—*The Mengel Co., Louisville, Ky.*, and *United States Plywood Corp., New York, N. Y.*

Portable Scraper Conveyor—A 6-page bulletin pictures modern portable conveyor usages and gives detailed specifications of 75-ton per hour model. Pictures and specifications of a portable car unloader that operates above or below the rail are presented in a 4-page bulletin.—*Jeffrey Mfg. Co., Columbus 16, Ohio.*

Road Rollers—Pictures and specifications of heavy-duty road rollers and accessories are presented in a 20-page booklet. Attachments include scarifier, cab, sprinkler system, roll-a-plane and electric lighting.—*Galion Iron Works & Mfg. Co., Galion, Ohio.*

Water Analyses—A new 44-page booklet, profusely illustrated, presents the various apparatus and chemicals which are used for industrial water analyses for plant control. The book features the test sets required for such determinations as hardness, alkalinity, phosphate, sulfate, dissolved oxygen, pH value, silica, and others. In addition, numerous comparators, photometers, turbidimeters, etc., are displayed. The book is valuable for the plant chemist, power plant executive, operating engineer, or others interested in the conditioning of industrial or municipal water.—*W. H. and L. D. BETZ, Gillingham and Worth Sts., Philadelphia, 24, Pa.*

Air Conditioning — This manufacturer of air conditioning and refrigeration has issued a condensed catalog covering equipment for use in industrial production. Listed in the 8-page folder is a wide range of equipment for temperature and humidity control, refrigeration and industrial heating. *Carrier Corp., Syracuse, N. Y.*

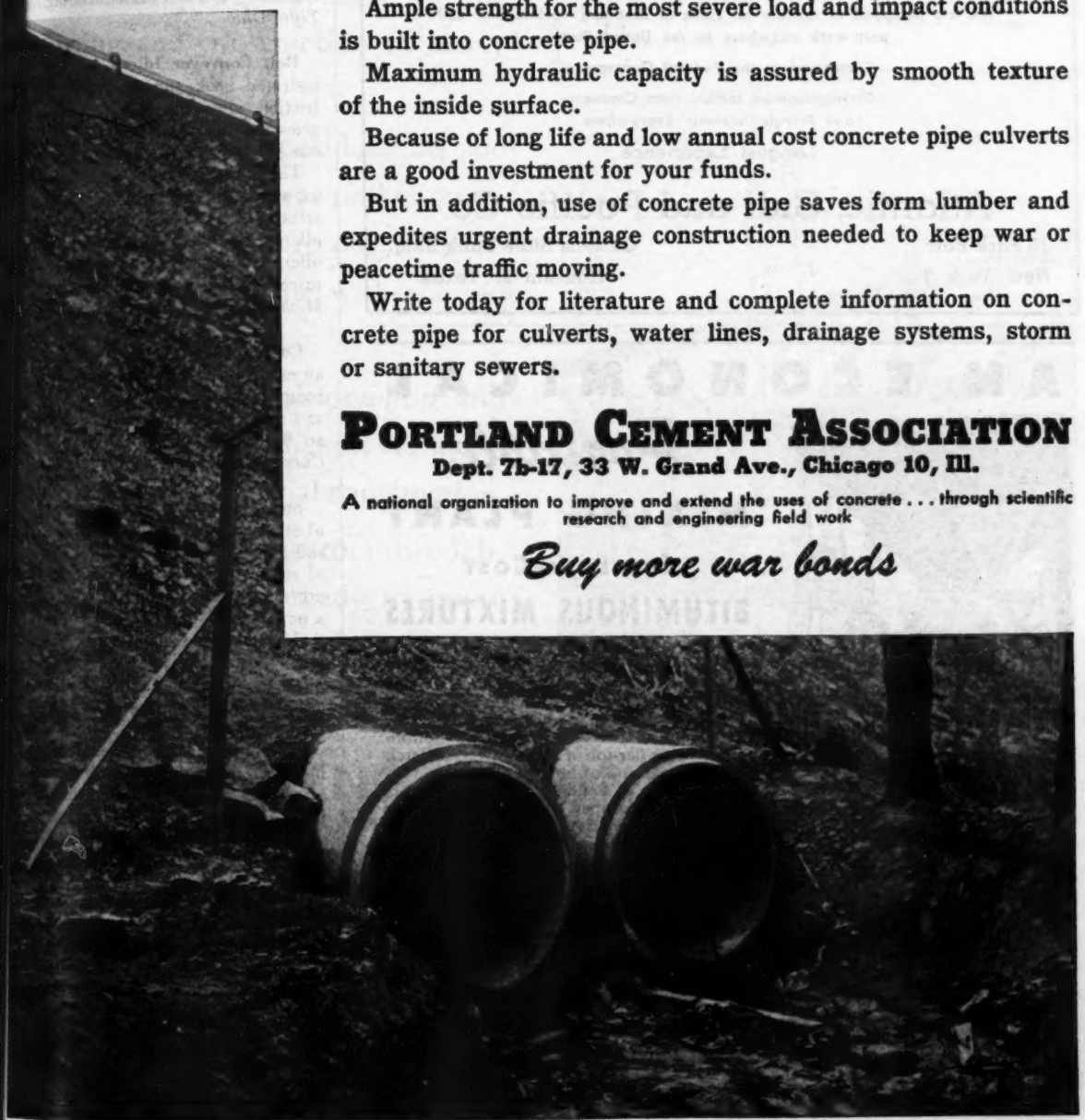
Centrifugal Pumps—This handsome booklet contains seven sections, as follows: Manufacturing information; self-priming centrifugal pumps; high-pressure pumps; electric or belt driven; diaphragm and plunger pumps; engineering data—how to select the correct pump; and an index and general information.—*Marlow Pumps, Ridgewood, N. J.*

Air Inlet Valves—Design and engi-

CONCRETE PIPE CULVERTS

save form lumber, time and materials for highway drainage structures

This twin 48-in. concrete pipe culvert under a deep fill will give years of service at minimum cost.



The durability of concrete pipe culverts has been proved by their service record under thousands of miles of highways. On one notable highway project alone more than 300,000 ft. of concrete culvert pipe was installed.

Ample strength for the most severe load and impact conditions is built into concrete pipe.

Maximum hydraulic capacity is assured by smooth texture of the inside surface.

Because of long life and low annual cost concrete pipe culverts are a good investment for your funds.

But in addition, use of concrete pipe saves form lumber and expedites urgent drainage construction needed to keep war or peacetime traffic moving.

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neering data relating to the use and installation of air-inlet valves on pipe lines are contained in Bulletin No. 125. Of special interest are the large-scale nomographs incorporated in the bulletin by means of which the designer may eliminate calculations by formula—*The Simplex Valve & Meter Co., 68th and Upland Streets, Philadelphia 42, Pa.*

Belt Conveyor Equipment—This catalog No. 60-B contains 160 pages of information for the belt conveyor user and the designing engineer. It covers specialized data regarding the application of belt conveyors for the handling of materials, together with a listing of belt conveyor equipment. Included are charts and tables to help in the choice of proper units for any specific service and location.—*Webster Manufacturing, Inc., Tiffin, Ohio.*

Belt Conveyor Idler—A 16-page illustrated book announces a new anti-friction idler for belt conveyors and gives detailed information on the various sizes available in the several types. These types include troughed carrying-run idlers; flat-roll carrying and return idlers; troughed self-aligning idlers; and self-aligning return idlers. Dimensions, weights and list prices are given.—*Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.*

Concrete Curing—The properties of an entirely new type of concrete curing compound meeting A.S.T.M., federal, and state specifications are outlined in an 8-page booklet.—*Dewey and Almy Chemical Co., Cambridge 40, Mass.*

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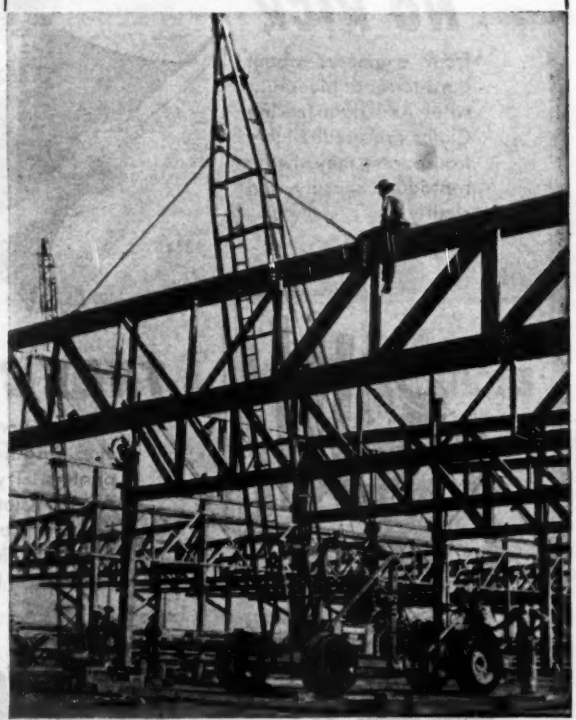

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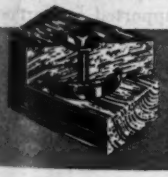

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BRIEF NEWS

The postwar planning committee o the Texas division of the American S ciety of Civil Engineers has divide Texas into five districts so that worth while public works projects for eac district may be ascertained and th needs of the whole state surveyed.

One or two members of the ASC postwar planning committee has bee assigned to each of these districts t ascertain and list worthwhile publi works projects. The members will the visit to accelerate preparation of plan and specifications for needed project

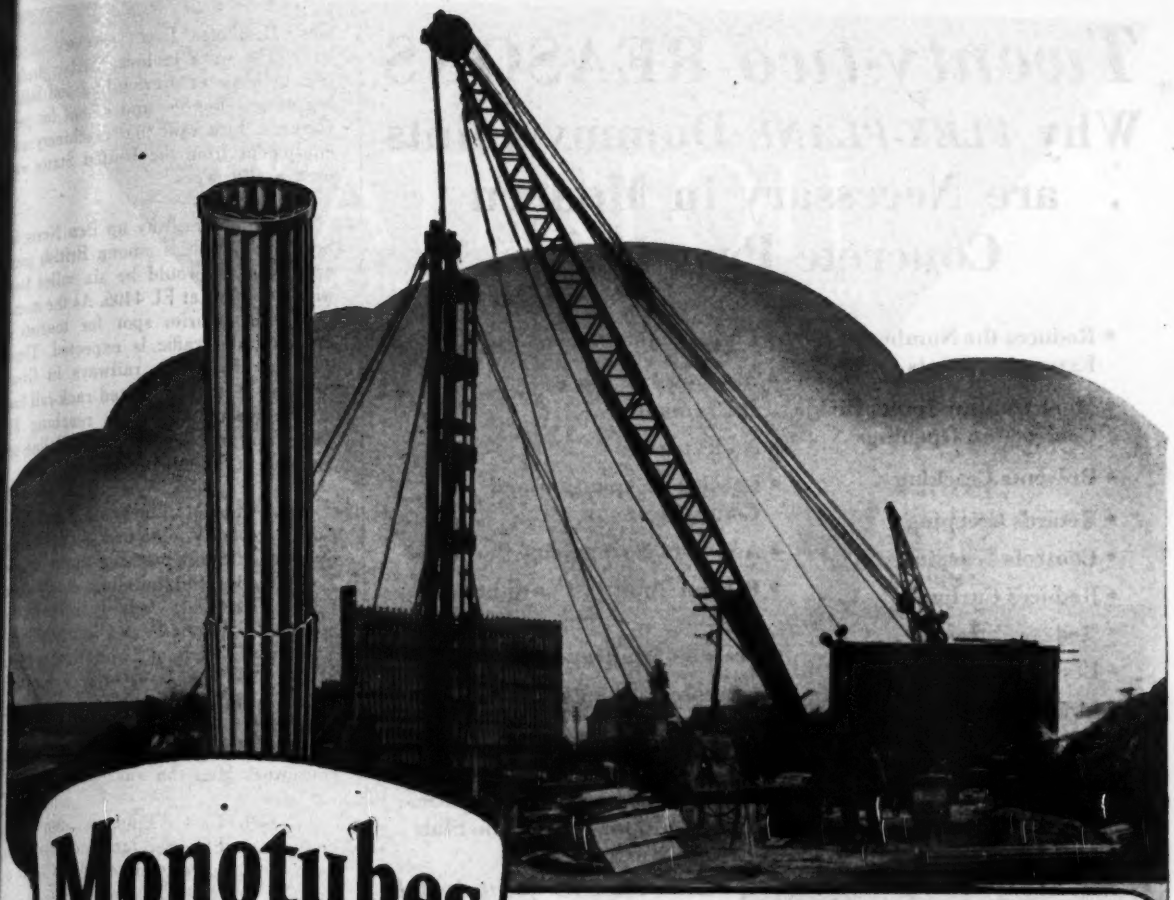
Bureau of Reclamation officials co sidering the proposed federal $70,000 000 gravity irrigation canal along th lower Rio Grande have also discusse a drainage system. It may be that th canal project will include a system o drainage to protect irrigated valle lands from high watertables and seep age.

The Galveston Drainage Associatio of Galveston, Tex., backed by the Me chants Association and the Chamber o Commerce, is raising a $19,000 fund t have an engineering survey made o what must be done to prevent excessiv rain and a storm tides from inundatin the industrial and business districts o the city. Heavy damage was inflicted o property in those districts during th Gulf hurricane of last July.

The service flag of the Illinois High way Department now has over 400 stars The ranks attained by former employe range from private to lieutenant-colonel All employes in the service were grante special leaves of absence by Governo Dwight H. Green with his personal as surance that when peace comes they wil be reinstated in their former position

Early congressional approval of th Kansas City flood control projects i the Pick plan was forecast recently b Mayor John B. Gage upon his return from the House Rivers and Harbor committee hearings at Washington Mayor Gage and others in the Kansa City delegation found many member of the committee favoring the flood con trol plan for the Missouri River recom mended by the Army Engineers as op posed to the proposals of the reclama tion service supported by northwestern states, including North Dakota, Mon tana and Wyoming.

Reconditioning of Salina Cru principal port of southwestern Mexico will be completed soon, according t



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- Assists in Normalizing the Slabs
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- Increases Strength of Slabs
- Produces Homogenous Structure
- Provides Expansion Relief for the Hot Upper Part of the Slab

FLEX-PLANE joint installing machines eliminate messy hand methods. Install all types of joints . . . ribbon, poured, premoulded, etc., with or without VIBRATION.

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Gen. Heriberto Jara, secretary of the navy. The work includes harbor dredging, breakwater overhauling and building of warehouses, and homes for port workers. Jara said that machinery and equipment from the United States was used on the work.

An electric railway up Ben Nevis, in Scotland, which is among British post-war projects, would be six miles long with a summit at El. 4406. As the mountain is a favorite spot for tourists a considerable traffic is expected. There are only two such railways in Great Britain—a steam-operated rack-rail line up Snowdon in Wales, reaching El. 3560; and an electric grip-rail line up Snaefell in the Isle of Man, El. 2034.

Mrs. Alida M. Emery of San Pedro, Calif., recently obtained a permit to operate a 75-ton portable crane at the Los Angeles Shipbuilding & Drydock Co. Her husband, Wade, is in the Navy, and she is the mother of four children. Formerly a telephone and linotype operator, Mrs. Emery plays the violin, and thinks handling a crane not too arduous providing you watch the rigger and don't talk. She plans to get back to housework after the war.

Lt. Col. C. C. Lindsay, consulting engineer and Quebec land surveyor, has been elected president of the Corporation of Professional Engineers of the Province of Quebec.

Three southern California communities expect that new flood control work will become one of the state's major economic assets as the result of the recent introduction by the House Flood Control Committee, in Washington, of legislation which would authorize a vast postwar flood control program.

Of the total of $810,000,000 mentioned in the bill, nearly $44,000,000 would be spent on four southern California projects already approved by Army Engineers, as follows:

Los Angeles—San Gabriel basin and Ballona creek, $25,000,000 for compre-

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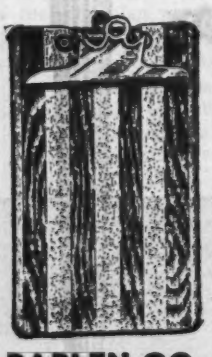

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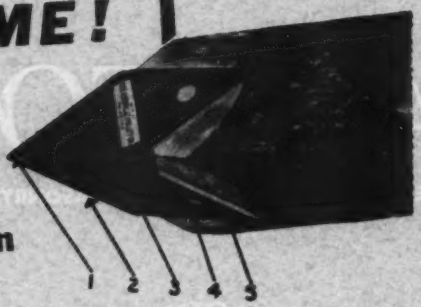

In addition to making your piles drive easier and faster, American Pile Shoes are easier and quicker to put on.

No rounding of the point of the pile is necessary because American Pile Shoes are four-sided. Simply chop two opposite sides of the end of the pile to a point; give the pile a quarter turn and chop the remaining two sides to a point. Then slip the pile shoe over the pointed end of the pile and nail it securely through the nail-holes provided.

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River basin, $8,380,000.

Ventura River Basin—$10,000,000 f
Santa Ana River basin and for p
tection of Orange county, includi
projects on Lytle and Cajon creeks f
protection at the towns of San Bern
dino and Colton.

San Diego—$370,000 for San Die
River project.

Directors of the Brazos River Cons
vation and Reclamation District ha
decided to finish the Bob Baskin Da
near Rule, Tex., and the Whitney Da
approved by Congress, near Hillsbo

The Baskin Dam, a reclamation pr
ect, will irrigate 35,000 acres in W
Texas. The Whitney Dam will be u
for flood control, but will also prod
power with an ultimate potential ge
ating capacity of 50,000 kw. It will e
$8,500,000.

Connecticut's Attorney General Fr
cis S. Pallotti has ruled that the Mer
Parkway Commission has no cont
over the parkway funds. James Mel
chairman of the commission, reque
an opinion as to whether or not the co
mission could use royalties from ga
line stations along the parkway. T
ruling was: "The commission has
authority under the law to handle r
alty funds. The gasoline stations al
the parkway are built with money fr
the state highway department, and
under jurisdiction of that departme
and the money must remain in t
fund."

Montana has $42,000,000 in pub
work projects for which the state is p
pared to let contracts during the fi
year of the postwar period, it was a
nounced recently by Governor Sam
Ford.

The projects include $10,000,000
road work, $6,000,000 for reclamati
of 216,000 acres of land, $1,000,000
the extension of irrigation projects, $

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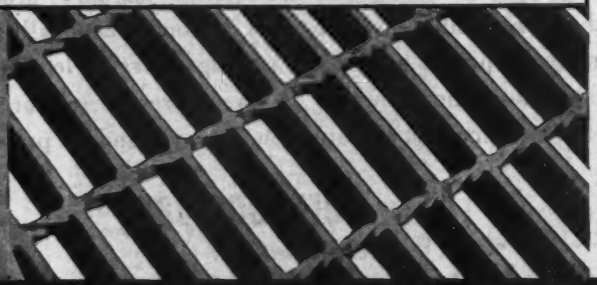

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With a Buckeye Spreader, there's no need for raking and brooming, no patching, no cleaning up edges, no filling in low spots. Many users report savings up to 50% in time and labor, and 20% on materials—and in addition—they get a better job.

Buckeye Spreaders are easy to use. Every part is designed for maximum strength and treated to resist wear so there is little lost time for repairs.

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Manganese Steel and "Counterflow" Design: *an Unsurpassed Combination for Dredge Pumps*

The entrance of manganese steel into the dredge pump picture many years ago set a new standard of service life for pump water-ends through the impact and abrasion resistance afforded by the "toughest steel known." Previously the useful life of the wearing parts had been of a limited duration.

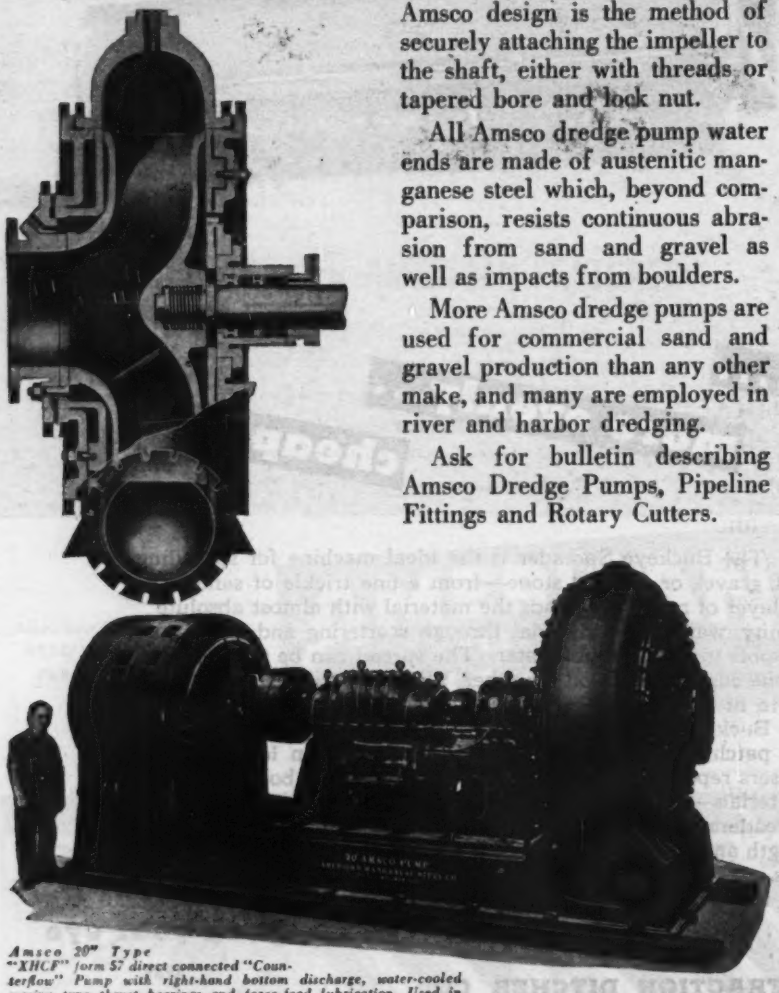
The Amsco "Counterflow" pump, which has been meeting the most severe requirements for nearly a decade, marked another long step forward in dredge pump design.

The "Counterflow" design, pictured below, circulates clear water under pressure between the impeller shrouds and the side plate liners. Abrasive wear is greatly reduced by thus replacing grit-laden water which is a cutting agent with clear water which is a lubricant. The wide funnel-mouthed impeller minimizes end thrust and internal leakage. Another important point of this Amsco design is the method of securely attaching the impeller to the shaft, either with threads or tapered bore and lock nut.

All Amsco dredge pump water ends are made of austenitic manganese steel which, beyond comparison, resists continuous abrasion from sand and gravel as well as impacts from boulders.

More Amsco dredge pumps are used for commercial sand and gravel production than any other make, and many are employed in river and harbor dredging.

Ask for bulletin describing Amsco Dredge Pumps, Pipeline Fittings and Rotary Cutters.



Amsco 20" Type "XHCF" form S7 direct connected "Counterflow" Pump with right-hand bottom discharge, water-cooled marine type thrust bearings and force-feed lubrication. Used in construction of dike embankment, Quabbin Reservoir, Commonwealth of Massachusetts.

Amsco

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

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OFFICES IN PRINCIPAL CITIES

800,000 for the irrigation of about 40,000 acres of land in cooperation with the federal government and $3,500,000 for 3,500 miles of rural electrification.

A. Farnell Blair, general contracting firm with headquarters in Decatur, Ga., has established a permanent western division office in San Francisco, Calif. The firm has completed $200,000,000 worth of government contracts.

Assurance that Portland Ore., will be able to provide nearly $25,000,000 worth of postwar improvements came when voters recently approved four projects. Approved were bond issues to provide $12,000,000 for cleaning up the Willamette River through a sewage disposal plant, $3,000,000 for improvements to harbor and municipal docks, $4,000,000 for roads and bridges, and a $5,000,000 special school tax levy to finance the building of eight new schools and the improving of present ones.

Wisconsin will more than quadruple its use of bituminous material for state truck highway resurfacing and repair according to James R. Law, chairman of the state highway commission. Heavy bituminous resurfacing will include about 400 miles requiring 6,400,000 gals. Light surfacing of 1,200 miles will use 8,900,000 gals., and seal coating of 384 miles will need 1,320,000 gals.

A fund of $50,000 to finance the state's opposition to the proposed Colorado River water treaty between the United States and Mexico was voted June 1 by the California state legislature.

Works Minister George H. Doucett of Ontario has announced that a one million dollar addition to the east block of the provincial governmental building in Toronto will be erected as a postwar project.

The provincial government of Ontario has authorized the immediate formation of a control commission for the Thames River in southwestern Ontario. It is expected to inaugurate control work at an estimated cost of between four and five million dollars. A corresponding conservation commission in the neighboring Grand River Valley has already built the Shand control dam.

A department of planning and development has been set up by Ontario to foster postwar planning. Dana Porter of Toronto, is minister in charge, and George R. Langford, professor of mining geology at the University of Toronto is director. The new department sponsored a recent 2-day conference in Toronto, attended by 500 representatives of municipal bodies, at which municipal

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Every time you run a length of non-preformed rope over a small sheave or drum, you create a high degree of bending fatigue that shortens the life of the rope. In contrast, when you use Bethlehem Form-Set in your clamshells, derricks, cranes, and power shovels, you've got rope that's "relaxed" because it's been made by the preforming process. Form-Set Rope is flexible . . . unusually free from built-in torsional stresses.

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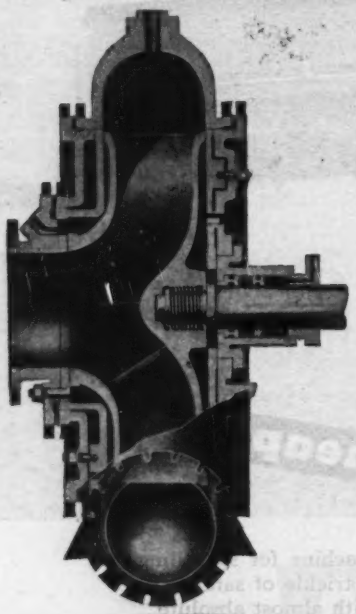

Amsco 20" Type "XHCF" form 57 direct connected "Counterflow" Pump with right-hand bottom discharge, water-cu marine type thrust bearings and force-feed lubrication. Use construction of dike embankment, Quabbin Reservoir, Comm wealth of Massachusetts.

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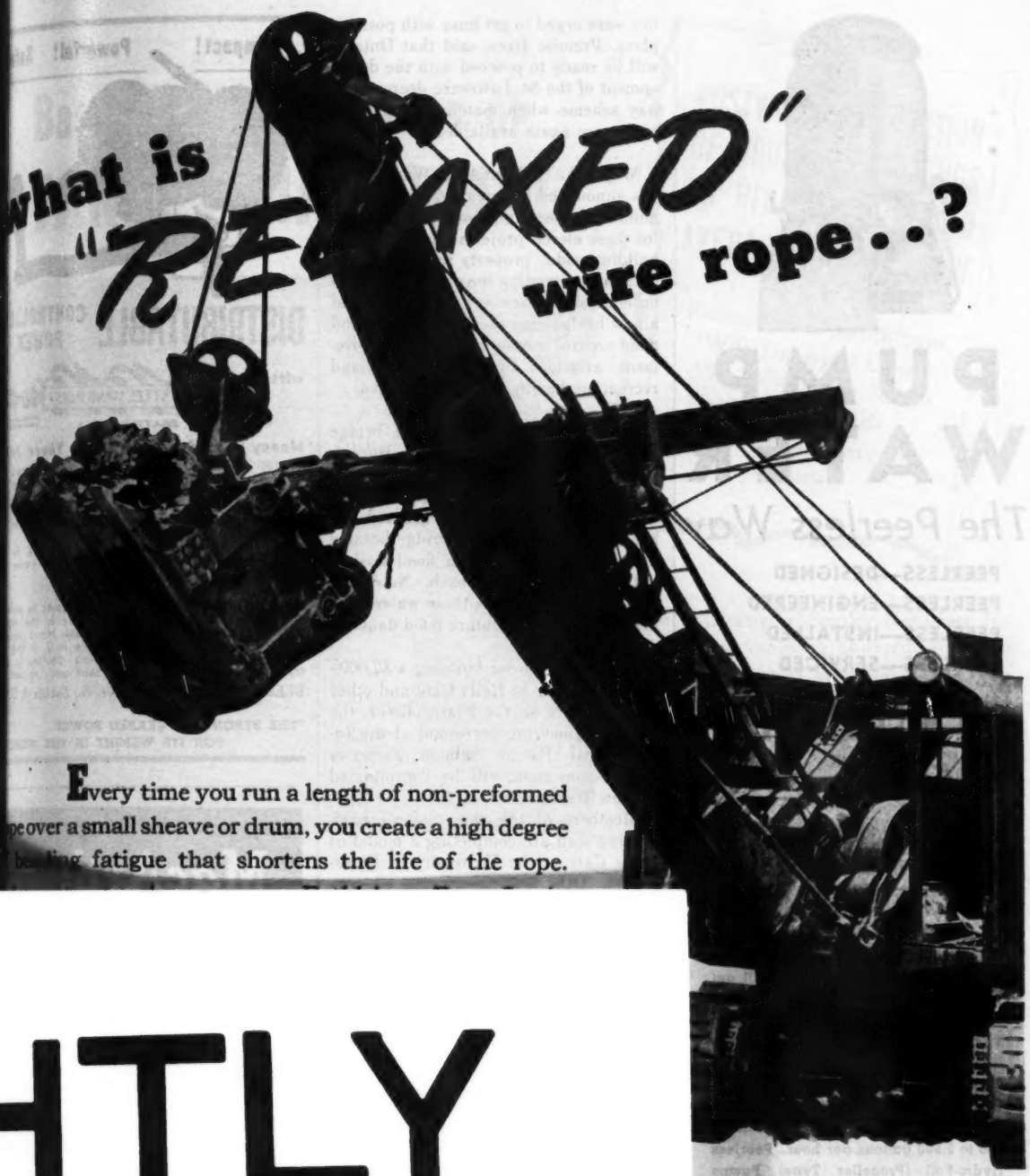
BOU



Every time you run a length of non-preformed rope over a small sheave or drum, you create a high degree of bending fatigue that shortens the life of the rope.

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Peerless Pumps are not confined to a single design. Peerless design is engineered to fit the precise conditions of your well. To insure proper installation our Authorized Distributor renders complete engineering service before and after installation, to make sure that the pump you buy will get full capacity out of your well, with maximum efficiency. Peerless Turbine Pumps are designed with oil or water lubrication, for capacities from 15 to 20,000 gallons per minute. Peerless Hi-Lift Pumps are for the smaller capacity deep wells, for producing 500 to 3,500 gallons per hour. Peerless Hydro-Foil (Propeller Type) Pumps will dewater up to 220,000 gallons per minute.

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PEERLESS

TURBINE, HI-LIFT and HYDRO-FOIL TYPES

PUMPS

ties were urged to get busy with postwar plans. Premier Drew said that Ontario will be ready to proceed with the development of the St. Lawrence deep waterway scheme when materials and manpower are again available.

Mayor A. N. Denton of Waco, Tex., has announced the creation of a 65-man municipal postwar planning committee, for these eleven projects: Rewriting the building code; property revaluation for taxation; extending the city limits; traffic controls; re-zoning; construction of a new bridge over the Brazos River and flood control measures; street improvement; aviation; a city auditorium; and recreation, health, and social service.

The $230,000 Sowell's Bluff bridge between Bonham, Tex., and Durant, Okla., which has been useless since early in 1942, will now be repaired, the War Production Board having granted the necessary materials. The bridge became useless when a Red River flood washed out its northern approach. Now that Denison Dam controls these waters, the bridge is safe from future flood damage.

In preparation for building a $2,000,000 fish ladder at Hells Gate and other rock barriers on the Fraser River, the entire engineering personnel of the International Pacific Salmon Fisheries Commission soon will be consolidated in New Westminster, B. C.

Members of the commission's engineering staff are completing a model of Hells Gate at the University of Washington. Milo Bell, in charge of construction of fish ladders at Bonneville Dam on the Columbia River, has been named chief engineer for the Fraser river project. A staff of United States and Canadian engineers will be employed.

A 30 percent increase in the average weight of trucks and the overloading of trucks with wartime supplies were factors which boosted California's highway maintenance costs nearly 100 percent during 1942-43, the California state division of highways reports.

Expenditures for road repairs approximated $9,000,000 and routine maintenance about $10,000,000 during the two-year period, it was reported by T. H. Dennis, maintenance engineer, who says that costs for similar work during 1944-45 are expected to equal if not exceed, those of the two preceding years.

A six and one half cent hourly wage increase above standard rates will be allowed union members employed on inside work or on building repairs by contractors belonging to the Seattle Construction Council, it was announced recently by the Twelfth Regional War

Compact! Powerful! Safe

DISTRIBUTABLE CONTROLLED POWER

with ALL STEEL HAND HOIST

SEATTLE, U.S.A.

Money Has Been Saved on These Jobs

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.

Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.

Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

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When raising, lowering, or placing costs by power are a serious problem, the answer is the right number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and 10 Ton sizes. Sold through leading dealers in all trade centers. List of dealers sent upon request.

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OF EVERY TYPE

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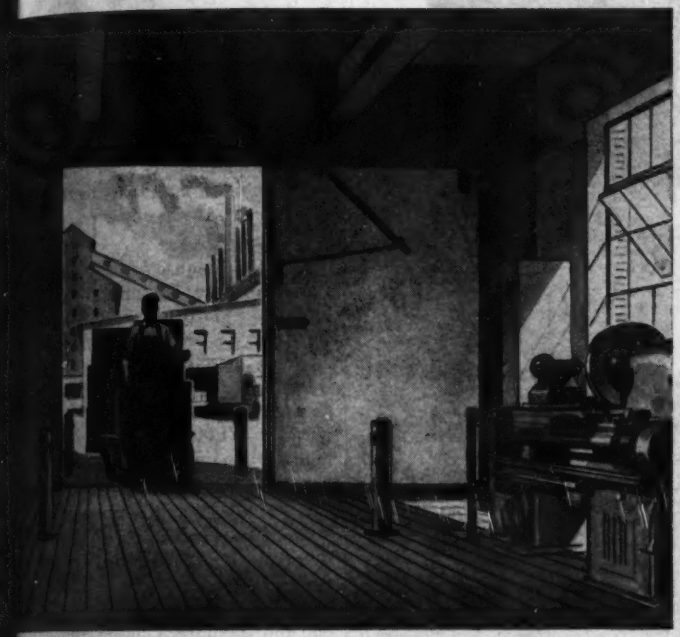
Base Your BIG Plans on STANLEY HARDWARE

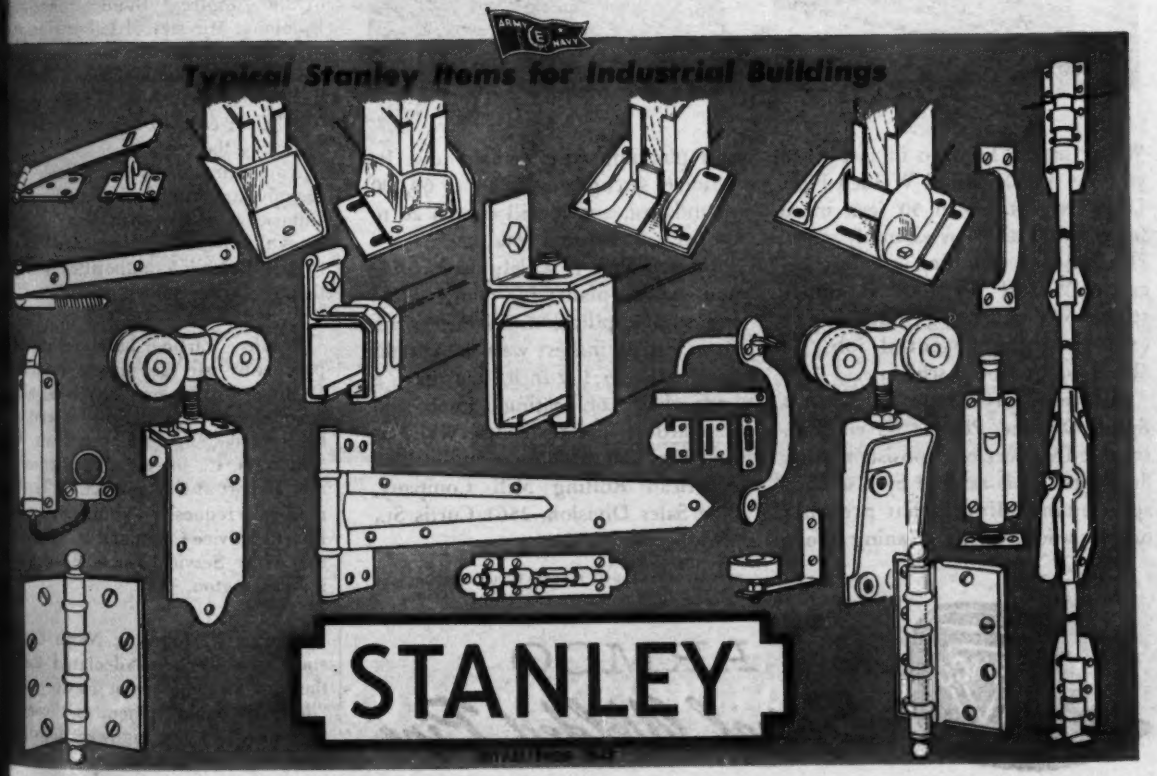


POSTWAR CONSTRUCTION OF INDUSTRIAL BUILDINGS TO HIT $210,000,000 AVERAGE PACE YEARLY

Estimated Expenditures Will Top by at Least 33-1/3% Those of the 1930-1939 Decade . . . F. W. Dodge Study Reveals

The leadership of Stanley Hardware for industrial building construction is a worthwhile sales advantage on every project. Match every construction need with the wide variety and unbeatable quality available in Stanley Hardware.

THE STANLEY WORKS
New Britain, Conn.



Specify this Pipe for Industrial Water Lines

Water supply lines go in fast when you use ARMCO Spiral Welded Pipe. Long lengths, up to 50 feet, mean fewer joints and less assembly work. Hauling and handling are fast because "Spiral Welded" is amply strong without being burdened by excess weight. Essential jobs go ahead on an all-out schedule.

Another advantage of ARMCO Spiral Welded Pipe is its efficient, trouble-free service. Consistent high flow capacity is assured by a smooth spun enamel lining that prevents tuberculation. Costly cleaning is out and pumping costs remain low. Its ultimate strength is 50,000 to 60,000 pounds psi, and it will stretch 20 to 30 per cent before breaking.

ARMCO Pipe is widely used *inside* and *outside* plants for many varied industrial applications. Diameters run from 6 to 36 inches; wall thicknesses from 9/64 to 1/2-inch. You have a wide choice of coatings, joints and standard or special fittings. Write us for prices and shipping promises. The American Rolling Mill Company, Pipe Sales Division, 2561 Curtis St., Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

Spiral Welded Pipe

Labor Board in Washington state. T qualify for the increase, local unio must have been affiliated with the Seatt Building Trades Council on March 1943.

A memorandum signed by Presiden Manuel Avila Camacho of Mexico per mits the importation of portland cemen free of duties, provided it is used o federal or state public works.

Preliminary plans have been mad for elevating the Southern Pacific Rai road's tracks through Reno, Nev., at cost of approximately $2,000,000, it w announced by Robert A. Allen, stat highway engineer. Cost of the jo which is planned as a postwar projec will be paid in large part by the federa government, it was reported.

Largely because of the passage heavy military equipment over Texa highways, more extensive maintenanc work has to be done now for the u keep of these highways, according DeWitt Greer, Texas state highway e gineer. As a result, $6,000,000 above th normal $11,000,000 spent yearly highway maintenance in Texas w have to be expended this year.

Steps to establish a system of a prenticeship training in the buildin trades in the Province of Quebec we taken at a recent conference of emplo ers and employees under the auspic of the Montreal Builders' Exchang Dominion Minister of Labor Humphr Mitchell announced that the gover ment would make $250,000 availabl during the current fiscal year, and $1 000,000 in each of the next nine yea to defray the cost.

Apprenticeship training projects a already in operation in the Provinces Ontario and British Columbia. Pro inces that establish a system acceptab to the dominion authorities will pa ticipate in the money grant.

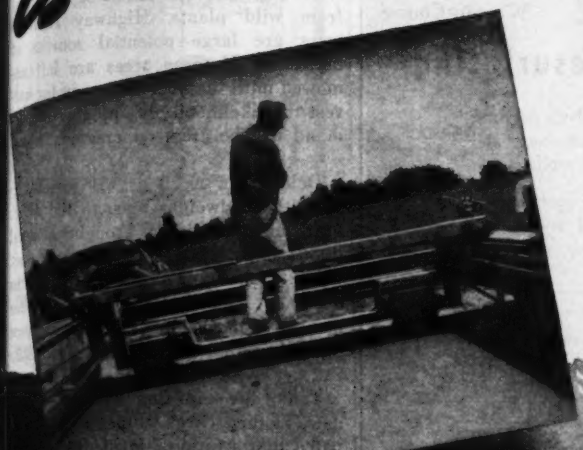
Because wartime building has tak practically all the private contracti facilities in the area, the local airpo commission has obtained the services two Army engineer regiments fro Sutton, N. C., for the construction of new airport at Gastonia, N. C. The co mission's request was approved by t Fourth Service Command at Atlanta an the Army Service Force Headquarte in Washington.

Charles N. Johnson, North Caroli state treasurer, has declared that the end of the current fiscal year t "deferred maintenance and constru tion fund" of the highway departme probably will amount to $50,000,00

KOEHRING FINISHED SLAB

is Accurately Finished

AT ANY PAVER SPEED



Mechanical slab surface finishing assures absolute accuracy for the final finish. With the Koehring Longitudinal Finisher, the slab surface is in exact accordance with the specifications, because the screed travel is mechanically adjusted. It cannot vary at any time. Errors in slab thickness are immediately detected, form settlement at joints is equalized. High spots are removed and low spots filled by the Longitudinal Finisher without changing the density of the concrete. Be sure you are meeting the specifications . . . use the Koehring Finisher on your job.

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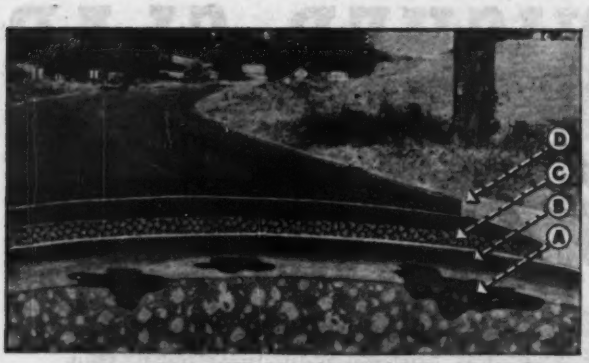
Milwaukee 10, Wisconsin

If you have idle construction equipment, make it available for home front use, where it is urgently needed. Register all your idle equipment with the local office of the War Production Board.

ARMY E NAVY

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT



The cross-section on the illustration shows steps usually taken in asphalt-resurfacing.

A
Spot Patching

B
Prime Coat

C
Binder Course

D
Wearing Course

The why and how of Asphalt-resurfacing

Many highway departments have found the answer to today's pressing problem of keeping highway systems up to wartime efficiency, and preserving them for peacetime needs by resurfacing with asphalt.

Asphalt-resurfacing now, will help make vital transport equipment—trucks, buses, tires, etc.—last for the duration. It will give you a head start on your highway program when travel-hungry, peacetime motorists ride again.

A Standard Asphalt Representative will be glad to give you details of the methods and procedure followed by other highway departments now using asphalt-resurfacing to keep up their highway systems. Call the local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois.

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STANDARD SERVICE

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Products Include: Concrete Vibrators, Gas or Electric, Surfacing Attachments, High Speed Tools • Vibratory Concrete Finishing Screeds • Rotary Concrete Floor Finishing Machines • Portable Gas Electric Generator Plants, 500 Watt to 12000 Watt Voltage Regulators and Portable Mountings Optional • Master Flood and Shovel [illegible]

the surplus being due to inability of the department to obtain labor and materials for new construction and repairs.

State and county highway departments have been requested by the Public Roads Administration not to mow roadsides where milkweed grows wild. Milkweed is a substitute for scarce kapok for life preservers and other uses. Since it takes three years to develop milkweed as a crop, this year's entire floss requirements must be obtained from wild plants. Highway right-of-ways are large potential sources of milkweed. If these areas are left unmowed until the pods are ready for harvest the likelihood of supplying the demand will be greatly increased.

Delivery in April of 154 vessels, 1,593,691 deadweight tons, to the U. S. Maritime Commission brought the total to 564 ships, 5,709,642 deadweight tons, put into service in the first four months of 1944. This exceeds the first four months of the banner shipbuilding year of 1943, which saw 536 ships of 5,360,712 deadweight tons delivered.

Ten of the ships delivered are the fast new Victory cargo ships. It is anticipated that a ratio of 11 of the fast type to eight of slower ships will make up the 1944 tonnage.

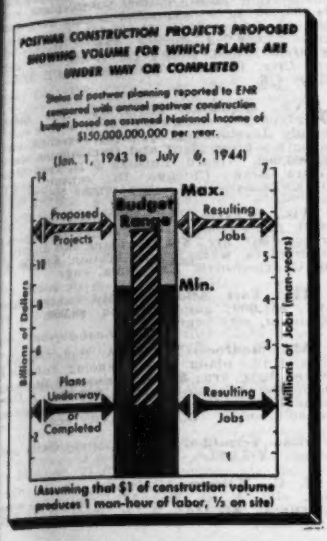
The commission has shifted a number of contracts to expedite construction of 68 additional large ocean-going tankers. Twenty-four are to be built by the Sun Shipbuilding and Drydock Co., Chester, Pa., 38 by Kaiser Co. at Swan Island, Portland, Ore., and six by Bethlehem-Sparrows Point Shipyard, Inc., at Baltimore, Md. Some construction originally assigned to these yards has been allocated elsewhere.

Officials of Austin, Tex., and Travis County are about to begin surveys for a 200-ft. wide super-highway north and south through the city.

A plan to connect Sacramento, Calif., with the Pacific Ocean by dredging a 30-ft. deep water ship channel in the Sacramento river has been endorsed by the Bay Area Maritime Committee, a group of leading business men and industrialists in the 11 counties bordering San Francisco Bay.

The Sacramento river project study, given widespread publicity about 15 years ago when a drive was launched to remove sand bars caused by hydraulic mining in the gold country, is being brought up to date by U. S. Army Engineers. Since the Shasta and Keswick dams now control flood water of the Sacramento, dredging of silt could restore the waterway which in California's early days was the only means of transportation inland.

POSTWAR PROJECTS



Projects proposed for postwar construction have been published in these columns since January, 1943, as they have been reported to Engineering News-Record.

The chart above shows, both in estimated dollar volume and in jobs or man-years of labor, how fast this reservoir of future work is filling up.

If you or your community are working on projects that have not yet been included in this "postwar reservoir," please send us an itemized list and description of them, including estimated cost and the names of the engineers who are at work on the plans. Then as you watch the arrows climb you will know that you and your community are contributing to the success of the NUMBER ONE JOB of preparing for peace.

Address your projects list to Manager, Business News Department, Engineering News-Record, 330 W. 42nd St., New York 18, N. Y.

MINIMUM SIZE OF PROJECTS PUBLISHED

Public Works	$25,000
Industrial Buildings	40,000
All Other Buildings	150,000

WATER SUPPLY

Ark., Paragould—City, City Hall, imprv. WW sys. $25,000.

Ill., Freeport—City, softening plant at present water plant site, $90,000. Consuer, Older & Quinlan, 211 W. Wacker Dr., Chicago, consult. engrs. W. J. Downing, ch. sanitary engr.

Mass., Rutland—Commonwealth of Massachusetts, Dpt. P. Health, State House, Boston, plans completed water expans., tank, piping and fire alarm sys., PH-1. $30,000. Whitman & Howard, 89 Broad St., Boston, consult. engrs. CD 3/2—ENR 3/23.

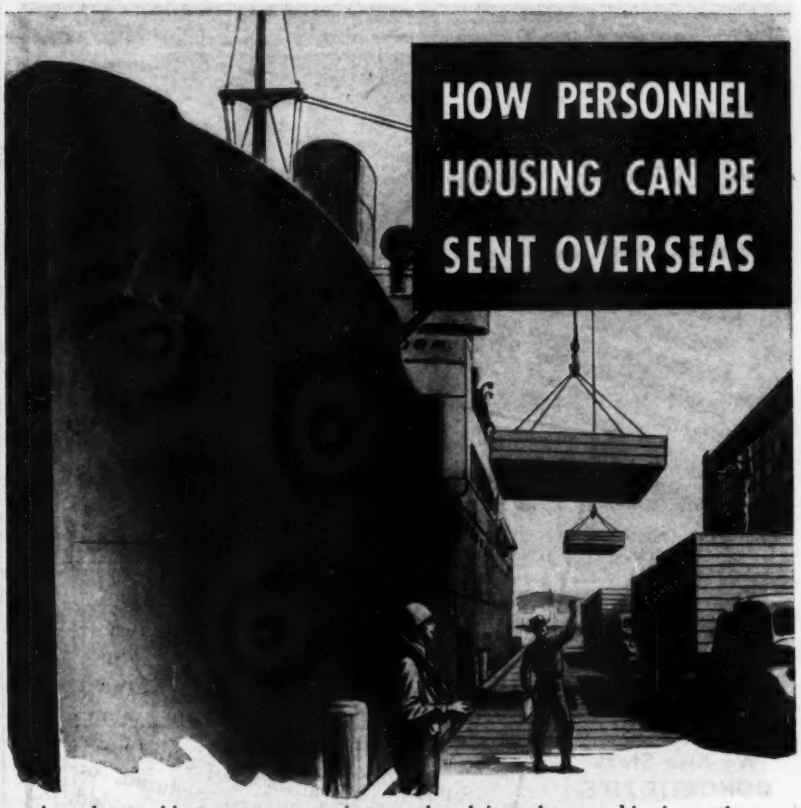
Mass., Wenham—Town Bd. Selectmen, Town Hall, preliminary survey water sys., about 2 mi. 8- to 12-in. watermains, 500,000 gal. standpipe. $250,000. H. E. Bailey, 177 State St., Boston, consult. engr.

★**Mich., Detroit**—Detroit Dpt. Water Supply, 735 Randolph St., plans completed. Reservoir 3, Springwells Pump. Station, $700,000. L. G. Lenhardt, 735 Randolph St., ch. engr. and genl. mgr.

★**Mo., St. Louis**—City, M. M. Kinsey, pres. Bd. Pub. Serv., 304 City Hall, 12 and Market Sts., Zone 3, $7,500,000 bond election Aug. 1, exten., imprv. municipal WW sys. CD 4/26/43—ENR 4/29/43.

Ore., Grants Pass—City, City Hall, water sys. $40,000. C. V. Signor, City Hall, engr.

Ore., Ontario—City, City Hall, plans completed 7 mi. Water sys. $75,360. J. L. Franzen, City Hall, engr.



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Any place a ship can go, or a train or truck, you can send modern, comfortable housing for personnel. The answer is the Dallas Hut—completely prefabricated, portable and demountable. No transportation troubles in getting the Dallas Hut where you want it—it's light and compact enough to be carried by truck or train, and it's excellent for overseas travel—easy to handle, to load and unload, taking a minimum of shipping space.

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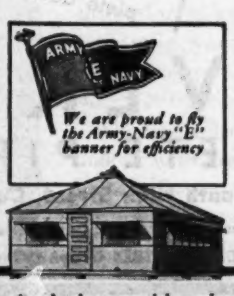

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POSTWAR PROJECTS (Cont'd.)

★**Tex., Houston**—City, voted $14,000,000 bonds, WW imprvs., incl. drilling 12 supply wells with combined daily capacity 30 m.g.; 100 m.g.p.d. rein.-con. impounding dam on San Jacinto River; 50 m.g.p.d. purification plant, mains, pump. plant, etc. $4,000,000 to be expended during 1944, $3,000,000 during 1945, $4,000,000 during 1946 and $3,000,000 during 1947. Horner & Shriffrin, Shell Bldg., St. Louis, Mo., and c/o City, Houston, Tex., engrs. CD 3/16—ENR 4/6.

★**Va., Roanoke**—City, Municipal Bldg., plans 50% completed Carvin's Cove water supply development, clearing reservoir, constructing filter plant and transmission main, $2,000,000. Alvord, Burdick & Howson, Civic Opera Bldg., Chicago, Ill., consult. engrs. C. E. Moore, mgr. City Water Dpt., engr.

Wis., DePere—City, H. Donen, clk., City Hall, plans completed, financing incomplete, water distr. sys., $11,270, plans and financing incomplete, water pump. station, $20,750. F. M. Charlesworth, Kaukauna, engr.

Wis., Fort Atkinson—City, water distr. sys., $81,600; pump. station, $8,000. E. F. Klement, city mgr.

Wis., Monroe—City, C. A. Roderick, clk., City Hall, plans and financing completed, water distr. sys., $80,100; plans and financing incompleted water reservoir, $32,000. J. Donohue Engrg. Co., 608 W. 8 St., Sheboygan, consult. engrs. Z. Gorder, city engr.

Alta., Vermilion—Municipality, water sys. exten. $75,000.

B. C., Kelowna—Glenmore, R. W. Corner, clk., P. O. Box 763, replacing wood pipelines, $44,140. W. R. Reed, P. O. Box 763, engr.

B. C., Prince Rupert—Municipality, addnl. reservoir capacity, $100,000. F. N. Good, Town Hall, engr.

B. C., Saanich (P. O. Royal Oak)—Municipality, W. A. Green, clk., Royal Oak, 9 m.g. rein.-con. reservoir, $90,000; water supply development, $400,000. H. L. Blakeney, Royal Oak, supt. Wks. and engr.

★**B. C., Victoria**—Municipality, M. F. Hunter, clk., tunnel from Sooke Lake to a balancing reservoir, $1,000,000. G. M. Irwin, City Hall, engr. CD 11/18—ENR 11/25.

Ont., Kitchener—Municipality, watermains, $100,000. M. Peguegnat, 245 Frederick St., engr.

Ont., Saltfleet (P. O. Winona)—Lincoln Co., W. H. Millward, clk., 2, Mamora St., St. Catharines, WW sys. About $75,000-$100,000. F. Weir, c/o owner, engr.

SEWERS, WASTE DISPOSAL

Ia., State Center—City, plans underway sewage disposal plant, $30,000. H. R. Green Engrg. Co., Bever Bldg., Cedar Rapids, consult. engrs.

★**Mich., Detroit**—City, Dpt. P. Health, City Hall, plans completed Baby Creek Enclosure, concrete structure for covered sewer to replace open creek, $1,440,000. G. R. Thompson, City Hall, city engr. CD 2/20/43—ENR 4/1/43.

★**Mo., St. Louis**—City, c/o M. M. Kinsey, pres. Bd. Pub. Serv., 304 City Hall, 12 and Market Sts., Zone 3, $7,950,000 bond election Aug. 1, constructing, repairing sewers and drainage works. CD 5/9—ENR 5/18.

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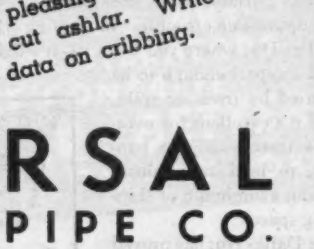

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STWAR PROJECTS (Cont'd.)

re., Ashland—City, City Hall, plans com- ted sanitary sewers, $75,000, storm sew- $50,000. F. W. Walker, City Hall, engr.

re., Eugene—City, City Hall, plans com- ted new sewers and sanitary facilities, 0. W. Clubb, City Hall, engr.

re., Coquille—City, City Hall, plans com- ted, reconstructing sewer sys. $172,120. Gearhart, City Hall, engr.

re., Corvallis—City, City Hall, sewage erceptor and primary treatment plant, 0. V. L. Goodnight, City Hall, engr.

re., Dallas—City, City Hall, sewage dis- al plant, $100,000. C. B. Sundberg, City ll, engr.

re., Grants Pass—City, City Hall, sanitary ers, $70,000, drainage facilities, $45,000. V. Signor, City Hall, engr.

re., Hillsboro—City, City Hall, plans com- ted sanitary sewerage sys. addn. $30,000. W. Barney, City Hall, engr.

re., Hood River—City, City Hall, sewage osal plant, $54,500. E. Hobson, City Hall, r.

re., Independence—City, City Hall, sew- disposal plant, $25,000. M. M. Nelson. Hall, engr.

re., Lebanon—City, City Hall, plans com- ted sanitary sewers, $200,000; sewage dis- al plant, $50,000. S. I. Stewart, City Hall, r.

re., Medford—City, City Hall, plans un- ay sewage disposal plant, sewerage sys. n. $180,000. D. T. McDonough, City Hall, r.

re., Mt. Angel—City, City Hall, sewage osal plant, $32,225. J. Hassler, City Hall, r.

re., Myrtle Point—City, City Hall, sewage osal plant, $90,000. C. Lehmanowsky, y Hall, engr.

re., Ontario—City, sewage disposal plant, 000. J. L. Franzen, City Hall, engr.

re., Oregon City—City, sewage disposal t, $212,000. J. L. Franzen, City Hall, engr.

re., Pendleton—City, sewage disposal t, $150,000. F. B. Hayes, City Hall, City r.

re., Salem—City, sewage treatment plant, er facilities, $200,000. J. H. Davis, City ll, engr.

a., Titusville—City Council, C. Becker, Titusville, sewage disposal plant, $200,- $300,000.

, Va., Roanoke — City, Municipal Bldg., sewer interceptors, sewage disposal plant, 50,000; plans 25% completed, storm drains various sections of city $1,036,000 and itary sewer exten. $200,000. J. L. Went- rth, city engr.

Wis., Berlin—B. Grota, city clk., City Hall, ans completed intercepting sewers, $57,764, ney available; plans underway pump. tion and road to station, $33,588, money ailable; sewage treatment plant, $55,000, ney partly available; plans completed nk sewers, $58,316, financing incomplete; ns and financing not completed sanitary ers, $5,000. Foth, Boyd & Porath, Green g, consult. engrs. CD 8/26—ENR 9/2.

Wis., Burlington—City, A. Zechel, clk., ty Hall, plans completed storm sewers, 000. R. P. Birchler, acting city engr. 3/19/43—ENR 3/4/43.

Wis., DePere—City, H. Donen, clk., City ll, plans and financing completed san- ry sewers, $21,800; plans incomplete, fi- cing completed storm sewers, $28,373. M. Charlesworth, Kaukauna, engr.

Wis., Fort Atkinson—City, plans not com- te, financing complete, sanitary sewers, 000; storm sewer, $8,000; garbage dis- al, $35,000. E. F. Klement, city mgr.

Wis., Kaukauna—City, K. E. Marzahl, clk., y Hall, storm sewers, sewage treatment nt, $58,000. F. Charlesworth, city engr.

Wis., Monroe—City, C. A. Roderick, clk., y Hall, plans completed sanitary sewers, 500; storm sewers, $12,750; plans incom- te storm sewers, $55,000; sewage disposal nt, $55,000. Financing incomplete. J. Dono- e Co., 608 N. 8 St., Sheboygan, consult. engr. Gorder, city engr.

Wis., Waupaun—City, sewage treatment nt, $150,000. J. Donohue Engrg. Co., 608 . 8 St., Sheboygan, consult. engr. CD 1/43—ENR 2/4/43.

B. C., Prince Rupert—Municipality, repair- exten. sewer services. $200,000. F. N. od, Town Hall, engr.

Ont., Beamsville—Village, H. N. Reid, ve. sewerage sys., incl. 6 to 7 mi. sewer, wage disposal plant, and main to Lake tario. About $150,000.

R-S

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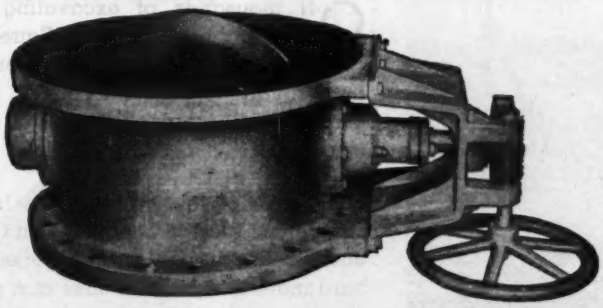

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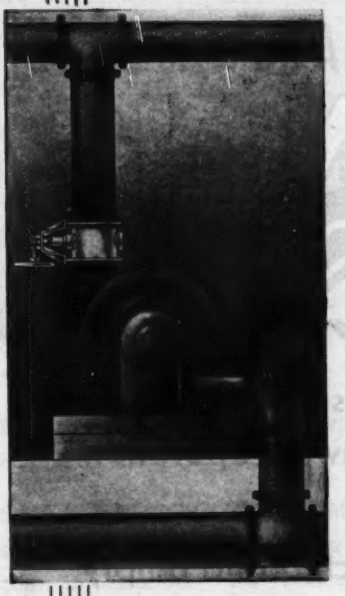

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POSTWAR PROJECTS (Cont'd.)

Ont., Ingersol—Municipality, R. McNi... clk., City Hall, sewerage sys. $107,...

BRIDGES

★**Mo., St. Louis**—City, c/o M. M. Kin... pres. Bd. Pub. Serv., 304 City Hall, and Market Sts., Zone 2, $1,710,000 bo... election Aug. 1, constructing, repair... bridges, viaducts and underpasses, CD 5/... ENR 5/18.

Neb., Omaha—City, reconstructing flo... of viaducts, changing from worn out wo... floors to concrete surfacing, one going w... from 32 St., one at 40 and Hamilton St... one on south 42 St., and one on O St. $75,... E. W. Woodbridge, City Hall, city engr.

Pa., Erie—The New York, Chicago ... St. Louis R. R. Co., J. C. Wallace, ch. eng... Terminal Tower, Cleveland, O., highw... and pedestrian underpass 19 and Para... Sts., Over $50,000.

Tenn., Nashville—City, L. L. Luton, co... City Hall, designs by Freeland Roberts ... Co., engrs., 3rd National Bank Bldg., Spar... man St. bridge, $125,000.

★†**Texas**—Galveston Co., State Hy. D... and Federal Government, c/o U. S. En... 25 St. and Avenue F, Galveston, plans und... way 4,500 ft., underpass or tunnel betwe... two 100 ft. ventilating towers, concrete a... proach trestles for total 3,600 ft. length... lane highway, etc., between Galveston ma... land and Port Bolivar, $8,500,000. Palmer ... Baker, Inc., St. Michael and Royal Sts., M... bile, Ala., consult. engrs. CD 1/10—ENR 1/...

★**Va., Roanoke**—City, Municipal Bld... plans 5% completed viaduct over ra... road tracks, bridge over Roanoke River a... railways tracks, and bridge over Tink... Creek, $681,500; plans pedestrian bridge o... Roanoke River connecting Maher Field w... South Roanoke Park, $17,500. J. W. We... worth, city engr.

Wis., Elkhorn—Walworth Co., L. D. Da... lap, clk., bridge, $90,000. H. J. Pete... Elkhorn, co. engr.

★**N. S., Halifax**—Civic Planning Comm., C... Hall, cross harbour suspension brid... with provision for 5-lane motor traffic a... with 2-lanes for pedestrian use, $500,0... viaduct over railway cut connecting Qu... pool Road and Young Ave., $350,000.

Ont., Fort Erie—Niagara Parks Comm., ... Central Ave., overhead bridge, $30,000.

Que., Arvida—Aluminum Co. of Canad... Ltd., Sun Life Bldg., Montreal, aluminu... bridge over Saguenay River. About $200,0...

Que., Quebec City—City, L. Borne, may... City Hall, bridge across St. Charles Riv... on Renaud Ave. in Sacre Coeur Parish, Abo... $115,000. E. Hamel, c/o owner, engr.

STREETS AND ROADS

★**Mo., St. Louis**—City c/o M. M. Kin... pres. Bd. Pub. Serv., 304 City Hall, ... and Market Sts., Zone 3, $7,820,000 bond el... tion Aug. 1, establishing, opening, widenin... constructing, reconstructing highways, par... ways, boulevards, alleys. CD 4/26/43—E... 4/29/43.

N. C., Wallace—J. A. Harrell, mayor, C... Hall, plans underway street paving, sto... sewers. $125,000. W. A. Townes, Ralei... Bldg., Raleigh, consult. engr.

Ore., Ashland—City, City Hall, plans co... pleted sidewalk constr., $75,000; str... imprvs. $125,000. F. W. Walker, City Ha... engr.

Ore., Astoria—Clatsop Co., Court Hou... widening, resurfacing, oiling 30 mi. roa... $150,000. A. F. Danielson Court House, en...

Ore., Baker—Baker Co., Court house, ... road projects, 36 mi. $140,125. D. W. ... Nelson, Court House, engr.

Ore., Canyon City—Grant Co., Court Hou... plans completed 30 mi. road imprvs. $25,5... W. Merritt, Court House, engr.

Ore., Coquille—Coos Co., Court Hou... plans completed grading, surfacing 3.3 ... market roads. $25,600. F. A. Robb, Cou... House, engr

Ore., Dallas—City, plans completed str... imprvs. $100,000. C. B. Sundberg, City Ha... engr.

Ore., Enterprise — Wallowa Co., Cou... House, plans 40% completed, constructi... repairing roads. $63,300. G. Jacob, Cou... House, engr.

Ore., Eugene—Lane Co., Court Hou... Eugene, plans 40% completed, road co... struction and repairs. $267,300. P. M. Mor... Court House, engr.

Ore., Grants Pass—Josephine Co., Cou... House, plans completed constructing, repa... ing roads. $139,600. W. P. Haselrigg, Cou... House, engr.

Ore., Grants Pass—City, City Hall, str... imprvs. $27,000. C. V. Signor, City Ha... engr.

WAR PROJECTS (Cont'd.)

Hermiston—City, City Hall, plans ...leted street imprvs. $40,000. W. W. ...ouse, City Hall, engr.

Hood River—Hood River Co., Court ..., plans completed constructing, re... 13 mi. roads. $91,450. C. M. Hurl... Court House, engr.

Lakeview—Lake Co., Court House, ... construction and repairs. $225,000. W. ...quist, Court House, engr.

Lebanon—City, City Hall, plans com... ...l street imprvs. $100,000. S. I. Steward ... Hall, engr.

Medford—Jackson Co., Court House, ... completed road construction and re... $360,000. P. B. Rynning, Court House, ...

McMinnville — Yamhill Co., Court ..., constructing, repairing roads. $40, ... R. W. Herring, Court House, co. engr.

Moro—Sherman Co., Court House, ... 50% completed road construction and ... $30,550. D. Reid, Court House, ...

Ontario—City, City Hall, plans com... ...d street imprvs. $66,392. J. L. Franzen, ... Hall, engr.

Salem—Marion Co., Court House, ... completed, road construction and re... $331,000. N. C. Hubbs, Court House, ...

Tillamook — Tillamook Co., Court ..., plans completed constructing, repair... ... roads. $177,950. W. Stanley Coates, ...rt House, engr.

Tex., Anahuac—G. C. Jackson, Judge ... Chambers Co., $3,861,000 bond election ... 2½ road and bridge construction.

Va., Roanoke — City, Municipal Bldg., ...plans 10% completed sidewalk and ...et construction. $800,000. J. L. Went... ...th, city engr.

Wis., Elkhorn—Walworth Co., L. D. Dun... ...clk., Elkhorn, grading, surfacing var... ... roads. $200,000. H. J. Peters, Elkhorn, ...engr.

Wis., Fort Atkinson—City, street paving, ...d and gutter, $32,000, provisions made for ...ing money; street paving, $25,000, no ...vision made for raising money. E. F. ...ment, city mgr.

Wis., Kaukauna—City, K. E. Morzahl, clk., ...y Hall, street paving, curbs, gutters. ...000. Provisions made for raising money. ...M. Charlesworth, city engr.

Wis., Monroe—C. A. Roderick, city clk., ...y Hall, grading, paving, curbing, gutter... ...and sidewalks. $61,800. Z. Gorder, city ...r.

Wis., Sheboygan—City, H. Zehms, pres. ...P. Wks., City Hall, streets, pavements. ...000. Provisions made for raising ...ney. A. L. Boley, city engr.

Wis., Sparta—City, completed plans streets. ...000. O. O. Bergman, city engr.

Wis., West Bend—City, K. L. Weiss, clk., ...y Hall, plans completed street imprvs., ...000), curb and gutters $18,150. Financ... ...incomplete. Sutter, Berryman, Peterson ...Fuhr, Inc., 130 N. Wells Ave., Chicago, ...engrs.

EARTHWORK, WATERWAYS

Texas—Bureau of Reclamation, Interior ...Bldg., 19 and C Sts. N.W., Wash., 25, ...C., earth dam and canals on Concho ...er, serving 10,000 new acres land, Tom ...en Co., $10,000,000; on Frio River serv... 7,000 acres land, LaSalle Co., $2,100,000; ...Frio River, Uvalde Co., serving 12,000 ...re land, $5,600,000; on Hondo River, serv... 4,000 acres land, Medina Co., $1,700,000; ...North Canadian River, serving 3,200 ...re land, Sherman Co., $1,000,000; on ...ces River, serving 28,500 acres land, ...alla Co., $7,600,000; on Nueces River, ...ving 21,500 acres land, LaSalle Co., ...000,000; on Colorado River, serving 53,000 ...res land, Coke Co., $11,815,000.

Alta., Barons—Dominion Govt., Ottawa, ...t. irrigating 12,000 acres by running ...anch from Lethbridge Northern Irrigation ...$360,000. Prairie Farm Bd., 310 Mc...lum Hill Bldg., Regina, Sask., engr. CD ...9—ENR 12/9.

Alta., Nordegg—Dominion Govt., Ottawa, ...Ont., storage reservoir at The Gap on ...th Saskatchewan River to hold 368,000 ...re feet. $2,320,000. Prairie Farm Bd., ...Callum Hill Bldg., Regina, Sask., engr. ...9 12/3—ENR 12/9.

Alta., Willow Creek—Dominion Govt., Ot...wa, Ont., reservoir to augment water sup... for Lethbridge Northern, etc., by dam...ng Willow Creek and running canal to ...ert water into main canal of Lethbridge ...thern. $269,000. Prairie Farm Bd., 310 ...Callum Hill Bldg., Regina, Sask., engr. ...9 12/3—ENR 12/9.

British Columbia—Province of British ...lumbia, Victoria, irrigating 3,500 acres in ...kcroft, $90,000; 3,700 acres, South Thomp... ...n Valley, Pritchard, $90,000; 4,000 acres in ...rnon, $120,000; 2,000 acres at Grandview ...ights, in Armstrong, $60,000. A. Dixon, ...ct. P. Wks., Victoria, ch. engr.

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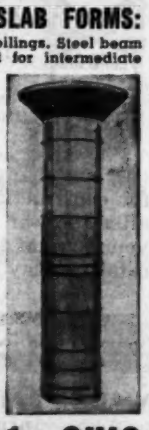

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POSTWAR PROJECTS (Cont'd.)

★**Ont., Brantford**—Grand River Conservation Comn., Brantford, dam on Nith River and Luther Marsh, and on Conestoga River, **$2,000,000.** Hon. D. Procter, Minister, Ont. Dpt. Planning & Development, Toronto.

PUBLIC BUILDINGS

Ark., Paragould—City, City Hall, addnl. power units and machinery in municipal power plant. **$90,000.**

Ark., Paragould—Greene Co., Paragould, courthouse and jail. **$150,000.**

Conn., Norwich—State, State Capitol, Hartford, mental diseases hospital addns. **$200,000.**

Conn., Willimantic—State, Dr. A. B. Grace, State Bd. Educ., 226 Palm St., Hartford, plans underway by Chandler & Palmer, 16 Franklin St., Norwich, and C. J. Malmfeldt, 36 Pearl St., Hartford, brick, steel administration bldg., Willimantic State Teachers' College. **$300,000.** CD 12/1—ENR 12/9.

Fla., Avon Park—State, Tallahassee, plans underway venereal hospital. **$150,000.**

Fla., Chattahoochee—State, Tallahassee, plans underway repairing Receiving Hospital, incl. new infirmary, sewage disposal plant, bldg. addns., etc. **$246,000.** Financing provided for.

Fla., Gainesville—State, Tallahassee, plans underway library bldg. addn., **$150,000;** experiment station dairy barn, **$50,000;** business administration bldg., **$150,000;** law bldg., engineering experiment station and engineering bldg., **$73,000;** Florida Union and horticulture bldgs., **$65,000,** all at University of Florida.

Fla., Tallahassee—State, Tallahassee, plans underway new auditorium and reconstructing old auditorium into class rooms at Florida State College for Women. **$365,000.**

★**Fla., Tallahassee** — State, Tallahassee, plans underway new south wing to State Capitol, **$289,000;** Supreme Court Bldg. addn., **$250,000.**

Ill., DeKalb—City, H. D. Hamilton, clk., City Hall, plans by Skidmore, Owings & Merrill, 104 S. Michigan Ave., Chicago, city hall. Over **$150,000.**

★**Md., Annapolis**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., sketches complete, plans underway by P. P. Cret, 1518 Walnut St., Phila., Pa., 3 story, bsmnt., 160x262 ft., granite and face brick auditorium, U. S. Naval Academy. **$5,000,000.** Gravell & Duncan, 1600 Walnut St., Phila., Pa., structural engrs. Moody & Hutchison, 1500 Walnut St., Phila., Pa., mechanical engrs.

Mass., Amherst—Commonwealth of Massachusetts, Dpt. Educ., 200 Newbury St., Boston, plans underway by L. W. Ross, 26 Kilby St., Boston, 3½ story, 80x152 ft., brick, limestone, steel laboratory, home economics and classroom units, Massachusetts State College. **$225,000.** R. D. Kimball Co., 5 Beacon St., Boston, consult. engrs. CD 4/7—ENR 4/20.

Mass., Cambridge—Comrs. Middlesex Co., Court House, sketches by James H. Ritchie & Associates, 20 Newbury St., Boston, brick, steel court house wing addn. **$175,000.**

Mass., Framingham—Town, B. J. Merriam, supt. Schools, Framingham, plans by J. William Beal Sons, 185 Devonshire St., Boston, 12 room, auditorium Senior High School addn., Union Ave. **$400,000.**

Mich., Detroit—Bd. Educ., 1354 Bway. Ave., plans 25% completed by J. Ivan Dise, 2431 Woodward Ave., 2 story, bsmnt., brick, steel, stone, rein.-con. school bldg. addn., Marion Law School site. **$188,539.**

Minn., Wadena—City, central heating plant, municipal electric light and power plant. **$150,000** (not official). Helmick, Edeskuty & Lutz, 412 Essex Bldg., Minneapolis, consult. engr.

★**Minn., St. Paul**—City, c/o City Workhouse, R. J. Kartak, supt., preliminary plans made by C. A. Bassford, city archt., 445 City Hall, new city workhouse on present site, Upper Afton Rd. and east city limits. **$1,030,000.**

★**Mo., St. Louis**—City, c/o M. M. Kinsey, pres. Bd. Pub. Serv., 304 City Hall, 12 and Market Sts., Zone 3, **$950,000** bond election Aug. 1, constructing, reconstructing hospitals and institutions; **$800,000** bonds fire engine house; **$250,000** bonds remodeling, repairing art museum. CD 4/26/43—ENR 4/29/43.

N. Y., Bedford Hills—Dpt. P. Wks., State Office Bldg., Albany, industrial bldg. for Prison Group at Westfield State Farm, for Dpt. Correction, State Office Bldg., Albany. **$75,000.**

N. Y., Binghamton—Dpt. P. Wks., State Office Bldg., Albany, plans 90% completed Proj. No. MH-12 storehouse addn., alterations Binghamton State Hospital for Dpt. Mental Hygiene, State Office Bldg., Albany, **$102,300.** Div. Construction, Div. Architecture, C. J. White, comr. Architecture, State Office Bldg., Albany, engr.

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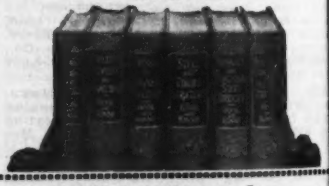

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STWAR PROJECTS (Cont'd.)

N. Y., Buffalo—Dpt. P. Wks., State Office Bldg., Albany, plans 85% completed. Proj. No. MH-46, storehouses, shop at Buffalo State Hospital, for Dpt. Mental Hygiene, State Office Bldg., Albany. $250,000. Div. Construction Div. Architecture, C. J. White, comr. Architecture, State Office Bldg., Albany, engr. CD 12/27—ENR 1/13.

N. Y., Cortland—Comrs. Cortland Co., new dormitory and infirmary for Cortland Co. Home. $200,000. State Aid Planning Funds Granted.

N. Y., Rochester—Dpt. P. Wks., State Office Bldg., Albany, plans 50% completed. Proj. No. MH-56, storehouse and cold storage bldg. at Rochester State Hospital for Dpt. Mental Hygiene, State Office Bldg., Albany. $234,400. Div. Construction, Div. Architecture, C. J. White, comr. Architecture, State Office Bldg., Albany, engr. CD 12/27—ENR 1/13.

N. Y., Syracuse—Dpt. P. Wks., State Office Bldg., Albany, Plans completed, Proj. No. MH-72, boiler house addn. at Syracuse State School, for Dpt. Mental Hygiene, State Office Bldg., Albany. $114,000. Div. Construction, Div. Architecture, C. J. White, comr. Architecture, State Office Bldg., Albany, engr. CD 12/27—ENR 1/13.

N. Y., Thiells—Dpt. P. Wks., State Office Bldg., Albany, plans completed Proj. No. MH-54, addn. power house and power plant equip. at Letchworth Village, for Dpt. Mental Hygiene, State Office Bldg., Albany. $264,000. Div. Construction, Div. Architecture, C. J. White, comr. Architecture, State Office Bldg., Albany, engr. CD 12/31—ENR 1/13.

N. C., Morganton—North Carolina School for Deaf, Morganton, plans underway by J. C. Benton & Sons, Wilson, large exten. program. Over $150,000. Wiley & Wilson, Lynchburg, Va., consult. engrs.

N. C., Raleigh—State Hy. & P. Wks. Dpt., Raleigh, new highway office bldg. Over $150,000. W. V. Baise, state hy. engr.

O., Bedford—City, O. E. Hutchinson, mgr., City Hall, city hall, fire and police station, central heating plant. $200,000.

Ore., Coquille—Coos Co., Court House, Coquille, court house. $202,000.

Ore., Lakeview—Lake Co., Court House, court house, memorial and county fair bldg. $375,000.

Ore., Pendleton—State Bd. Control, 109 State Capitol, Salem, treatment hospital at Eastern Oregon State Hospital. $225,000.

Ore., Salem—Salem General Hospital, W. Gahlsdorf, mgr., 50-bed maternity ward bldg. $250,000.

Va., Roanoke—City, Municipal Bldg., plans 10% completed by Smithey & Boynton, Roanoke, alterations, addn. and new school bldg., $1,605,000; plans completed by Smithey & Boynton, Roanoke, armory $450,000; plans completed by Eubank & Caldwell, Boxley Bldg., library, $265,000; plans by Eubank & Caldwell, Boxley Bldg., Melrose Branch Library, $20,000; plans land and bldg. for city farm, municipal garage and municipal bldg. addn., $545,000. J. L. Wentworth, city engr.

Wis., Wisconsin Rapids—Wood Co., J. A. Schindler, clk., plans by A. F. Bilimeyer & Son, Wisconsin Rapids, court house and home for aged addn. $220,000. CD 1/26—ENR 2/10.

Alta., Edmonton — Municipality, nurses home. $200,000.

Alta., Edmonton—Province of Alberta, Edmonton, public health laboratory, $200,000. Dpt. P. Wks., Edmonton, engr.

Alta., Lethbridge—Province of Alberta, Edmonton, dehydration plant. $50,000. Dpt. P. Wks., Edmonton, engr.

B. C., North Vancouver—Municipality, H. H. Valentine, supt. Works and engr., City Hall, auditorium and civic center. $150,000.

B. C., Prince Rupert—Bd. School Trustees, c/o J. Deane, chn., high school. $300,000.

B. C., Vancouver—Vancouver School Bd., c/o H. F. Hines, secy., school. $150,000.

B. C., Victoria—Victoria School Bd., F. G. Mullinar, chn., 640 Pandora Ave., 25 classroom school with gymnasium, auditorium, cafeteria, shops and laboratories, $975,000; technical shops for use by school, $175,000; North Junior High, 22 classrooms with auditorium, cafeteria, shops and laboratories, $530,000; Victoria Junior College, replacing present converted Castle residence, $225,000.

N. S., Halifax—Halifax Civic Planning Comm., City Hall, community center with accommodation for public meetings, incl. auditorium seating 2,000 persons, art gallery and library. $300,000.

Ont., Listowel—Municipality, L. A. Fleming, clk., plans by S. B. Coon & Son, 4 St. Thomas St., Toronto, high school, incl. auditorium, gymnasium, $200,000.

COMMERCIAL BUILDINGS

Conn., Bridgeport—Hungarian Reformed Church, 641 Hancock Ave., plans completed by P. F. Petrofsky, 177 State St., 1 story gothic design church and 2 story, bsmnt. school-parish house. $200,000. CD 1/17—ENR 1/27.

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POSTWAR PROJECTS (Cont'd.)

Conn., Stamford—First Presbyterian Parish, G. Stewart, pastor 90 Broad St., plans church and tower for Carillon Bell sys., Broad St. Over $150,000.

Ill., Springfield—Frisina Amusement Co., 421½ S. 6 St., 1 story, brick modern style theater and office bldg., 2600 block S. 6 St., in Woodside Twp. near here. $150,000.

Ind., Anderson—Sears Roebuck Co., H. W. Bressford, mgr., 1002 Main St., department store. $150,000 or more.

★**Ind., Indianapolis**—L. S. Ayres & Co., F. Ayres, pres., Meridian and Washington Sts., preliminary plans by Skidmore, Owings & Merrill, 104 S. Michigan St., Chicago, Ill., 10 story, bsmnt., brick, stone, rein.-con. department store remodeling and addn. $1,000,000.

★**Ind., Richmond**—Bd. Trustees Earlham College, Richmond, college expansion, incl. science bldg. $550,000, student center bldg. $276,000, power house. $300,000. Partly financed. CD 7/30—ENR 8/5.

Ia., Keokuk—Frisina Amusement Co., 421½ S. 6 St., Springfield, Ill., preliminary plans by C. Mayer, 1924 S. Glenwood, Springfield, Ill., modern style brick theater and office bldgs., 222 E. Main St. $200,000.

La., New Orleans—International Building, Camp and Gravier Sts., plans 25% complete by H. A. Benson, 1048 Canal Bldg., altering, reconstructing International House, incl. air-conditioning, etc. $200,000.

Mass., Cambridge—Radcliffe College, 10 Garden St., plans by Ames Child & Graves, 50 Beacon St., Boston, brick, stone library addn. Over $150,000.

Mass., Peabody—St. Thomas Parish, J. V. Cronin, pastor, 1 Margin St., plans by J. M. Gray, 175 High St., Boston, 2 story, bsmnt., brick, steel school. $150,000.

Mass., Lynn—St. Pius Roman Catholic Church, B. S. O. Kane, pastor, plans completed by T. G. O'Connell, 134 Newbury St., Boston, Mass., brick, stone church. $175,000. CD 2/10—ENR 2/24.

Mass., Worcester—Worcester Street Ry. Co., 107 Main St., plans by Cram & Ferguson, 248 Boylston St., Boston, 3 story, 65x125 ft., brick, steel, stone administration office bldg. $200,000.

Minn., Minneapolis—Augsburg College, 1 St. and 21 Ave. S., plans underway 2 story library and science bldg. $250,000.

★**Mo., St. Louis**—H. B. Deal & Co., Inc., 1218 Olive St., Zone 3, 16 story, bsmnt., 50x109 ft., office bldg., 14 and Pine Sts., own forces. $1,000,000.

N. Y., New York—810 Madison Ave. Corp., 143 W. 49 St., Zone 19, plans completed by H. I. Feldman, 415 Lexington Ave., Zone 17, apartment house. 20-28 E. 68 St.; 810-812 Madison Ave. $450,000.

N. C., Charlotte—Young Mens Christian Assn., D. P. Tillett, chn. Campaign Com., making plans YMCA bldg. $275,000.

N. C., Hickory—St. Andrews Lutheran Congregation, Hickory, Zeb B. Trexler, chn. Bldg. Com., Concord, church bldg., $150,000. Drive on for funds, site given.

Okla., McAlester—St. John's Church, McAlester, site secured, some financing has been done, catholic church structure. $175,000.

O., Cleveland—St. Joseph Roman Catholic Church, Rev. Thos. J. O'Reilly, pastor, 14422 Aspinwall Ave., limestone, steel, concrete church. $150,000.

★**Okla., Bartlesville**—Phillips Petroleum Co., Bartlesville, plans 25% completed by Arthur Gorman & Associates, Bartlesville, 12 story office bldg., incl. addnl. office space, gymnasium, recreation facilities, auditorium and cafeteria, $3,000,000. Land secured. S. E. Learned, Bartlesville, ch. engr.

★**Okla., Enid**—Phillips University, Enid, plans 10% completed by Geo. Blumenauer & Assoc., Enid, addnl. science and class room bldg. $500,000. Financing complete and site available.

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AR PROJECTS (Cont'd.)

Harrisburg—Bd. Mgrs. Harrisburg Front and Mulberry Sts., planning campaign addnl. facilities to dept., laundry, boilers and other material, laboratory and X-ray dept., erating rooms.

Providence—Osteopathic Hospital of 763 Broad St., brick, steel maternity addn. $150,000.

Dallas—Baylor University, 3301 St., about 3 bldgs., Dental School, of Nursing and dormitory. $750,000. ning to raise funds.

Houston—Houston Chapter, Asso- General Contractors of America, Inc., ain St., office bldg., Gray and Craw- $150,000. Site purchased.

Jacksonville—Lon Morris College, ville, plans 10% completed by S. H. 14 W. 10 St., Kansas City, Mo., fine dg. and boys' hall, etc. $200,000.

San Antonio—Central Christian Bd. Main and Camden Sts., plans mpleted by H. Steinbomer, 502 Fun- Pl., sanctuary and education bldg. CD 6/19.

Milwaukee—Young Men's Christian ociation, 633 N. 4 St., plans by R. A. and, 189 E. Wells St., Zone 2, YMCA $500,000.

Saint John—Famous Players Can- Corp., Royal Bank Bldg., Toronto, ans by Kaplan & Sprachman, 305 W. St., Toronto, Ont., structural steel, heatre, rein.-con. fdn. Over $150,000. —ENR 5/18.

Amherst—T. G. Spencer Co., Ltd., ohn, theatre. $150,000.

Hamilton—Bd. Governors, McMaster ity, Hon. A. Matthews, chn., 169 Bd., Toronto, plans by W. L. Somer- Bloor St. W., Toronto, science bldg., swimming pool, etc. $300,000-

Ingersoll—Ingersoll Collegiate Insti- J. J. McLeod, secy., new collegiate About $200,000.

Niagara Falls—Young Men's Chris- n, 823 Morrison St., Niagara Falls, ldg. $150,000.

Toronto—B & F Theatres, Ltd., 8 theatre, Donlands Ave. $150,000.

Montreal—Protestant Bd. School S. Scott, secy., 3460 McTavish St., by H. L. Fetherstonbaugh, 660 W. therine St., school. $350,000.

DUSTRIAL BUILDINGS

New Haven—GARAGE, etc.—Gill- otor Co., Inc., R. D. Gillmor, 170 Ave., brick service garage and les garage. $40,000 or more.

Anderson—PLANT—Coca Cola Bot- Co., 7 at Meridian Sts., plans 10% ed by E. F. Miller, Anderson Bank ottling plant, Fifth and Meridian 0,000 or more with equip.

Baltimore—PLANT—J. H. Filbert, N. Calverton Rd., margerine and roducts mfg. plant, Warwick Ave. anklin St. $50,000.

Baltimore—WAREHOUSE—Interna- Harvester Co., Mosher and Dickson lans 10% completed, warehouse.

Whitinsville — FACTORY — Whitin e Works, Main St., plans completed nd & Larsen, 814 Statler Bldg., Bos- rick factory addn. Bldg. 27. Over CD 10/28—ENR 11/18.

L. Falconer—PLANT—Chris-Craft, gonac, Mich., acquired 13 acre site ch boat mfg. plant. Over $40,000.

Woodstock—PLANT—York Knitting Ltd., Woodstock, purchase site for $5,000.

— MINING DEVELOPMENT — Huronian, Ltd., 80 W. King St., To- Ont., development deposits and es- structures at Larder Lake Proper- 0,000.

Montreal — PLANT — Johnson & , Ltd., 2155 Blvd. Pie IX, plant,

Montreal — WAREHOUSE, etc. — ern Canada Flour Mills Co., Ltd., Savreau, mgr., 300 St. Sacrament St., se and plant. About $400,000- Owners' staff. B. I. Walker, pres., cPherson St., Toronto, Ont., engr.

UNCLASSIFIED

Parsgould—LIGHT DISTRIBUTION —City, City Hall, imprv., exten. ner. sys. $25,000.

—AIRPORT — Illinois Aeronau- Comm., Springfield, airport, incl. drainage, rip-rapping, lighting, 0 ft. runways, landscaping, etc., on re tract in Horseshoe Lake area, in Co., serving East St. Louis, Granite Madison, etc. $1,980,000. H. C. Bird, ver, ch. engr.

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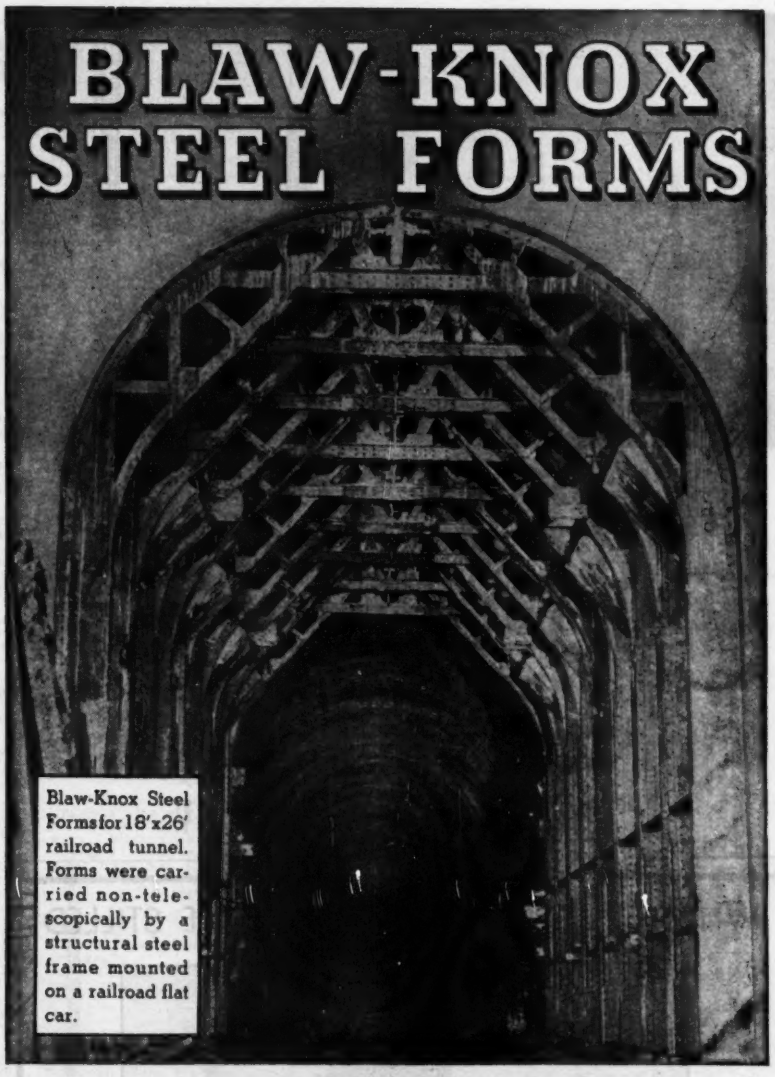

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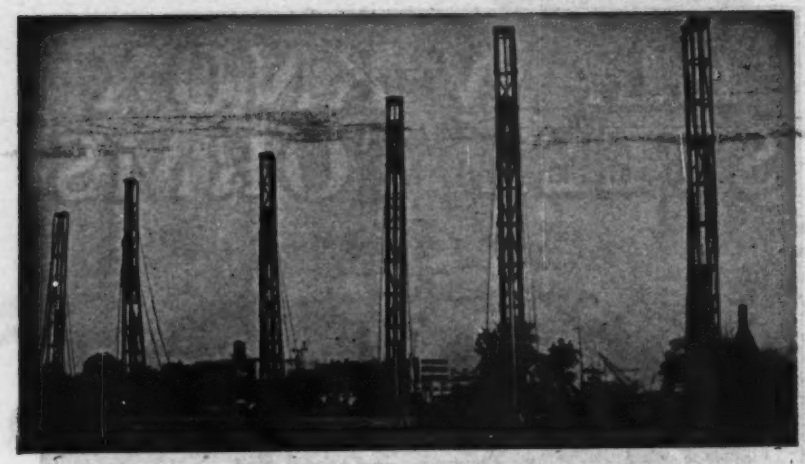

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POSTWAR PROJECTS (Cont'd.)

Kan., Lyons—AIRPORT—City, R. Lee, mayor, City Hall, approved $35,000 issue for purchasing airport site. $75,000.

★**Mo., St. Louis**—AIRPORT—City, c/o M. Kinsey, pres., Bd. Pub. Serv., City Hall, 12 and Market Sts., Zone 2, $9,627,000 bond election Aug. 1, airport development.

★**Mo., St. Louis**—PARKS, etc.—City, M. M. Kinsey, pres. Bd. Pub. Serv., City Hall, 12 and Market Sts., Zone 2, $3,625,000 bond election Aug. 1, develop parks, playgrounds; $750,000 bonds, dev ing, expanding zoo. CD 4/26/43—4/29/43.

Mo., St. Louis—WAR MEMORIAL—W War Memorial Comn., P. S. Miravalle, 3615 Olive St., St. Louis, Zone 8, perma war memorial in Memorial Plaza bet Market, Chestnut and 13 Sts., and 12 $30,000. 50% of funds raised.

★**Mo., St. Louis**—POLICE and FIRE TE GRAPH SYSTEM, etc.—City, c/o M Kinsey, pres. Bd. Pub. Serv., 304 City Ha and Market Sts., Zone 2, $2,200,000 election Aug. 1, imprv., exten. police and telegraph and telephone sys., and for h ing, equip. new central station for CD 4/26/43—ENR 4/29/43.

N. Y. Genesco—SWIMMING POOL, Dpt. P. Wks., State Office Bldg., Alb plans underway by Skidmore, Owing Merrill, 5 E. 57 St., New York, Pro CON-10, swimming pool and locker at Letchworth State Park, Livingston for Genesco State Park Comn., Conse tion Dpt. $50,000.

N. Y., Larchmont—PARK IMPRO MENTS—Village, imprv. Flint Park, 000. State Aid Planning Funds allotted.

N. Y., New York—BUS and PASSEN CAR PARKING FACILITIES—New City Tunnel Auth., 200 Madison Ave., st and preliminary plans underway bus passenger car parking facilities in vicini Manhattan Plazas of Queens Midtown Brooklyn-Battery tunnels. State Aid P ning Funds allotted. J. Quimby, 200 M son Ave., acting engr. of design.

Pa., Harrisburg—STANDARD LIGHT EXTENSION—City, R. M. Andrews, engr., City Hall, exten. standard lig for beautification of city streets. $250,0

S. C., Chester—AIRPORT—South C lina Aeronautics Comn., Columbia Air Columbia, airport expansion. $33,000.

Tenn., Nashville — SPORTS AREN Fisk University, 17 Ave. N., sports a $50,000-$75,000.

★**Tex., San Antonio** — AIRPORT PROVEMENTS—City, plans under municipal airport imprvs., incl. han shop taxiway exten., new east-west run etc. $600,000. A. B. & R. M. Ayres, Tr Tower Bldg., archts. T. Coghill, City city engr. CD 5/14/43—ENR 5/20/43.

Tex., San Antonio—PARK IMPRO MENTS—City, imprv. Koehler Park, grading, grounds development, etc. $ T. Coghill, City Hall, engr.

★**Va., Roanoke** — AIRPORT IMPRO MENTS, etc.—City, Municipal Bldg., port imprvs., administration bldg., $295,000, land for playgrounds, construc swimming pools and city park imp $296,000, J. C. Wentworth, city engr.; concrete baseball stand, $50,000, Smith Boynton, Roanoke, archts.

Wis., Fort Atkinson—PARKS, etc.— plans underway, financing complete, p $27,500; golf course, $25,000; air $100,000; street lighting, $7,000; plans financing completed swimming pool, $3 stadium, $12,000. E. F. Klement, city

Alta., Lethbridge—AIRPORT—Munic ity, airport. $150,000.

Alta., Vermillion — AIRPORT — Mu pality, airport. $150,000.

B. C., North Vancouver—PARK DEV OPMENT — Municipality, E. H. V tine, supt. Works and engr., City Hall, velopment Lynn Park, $50,000.

B. C., Saanich (P. O. Royal Oa STREET LIGHTING SYSTEM—Municipa W. A. Green, clk., Royal Oak, street li ing sys. for urban district, $50,000; p and playgrounds, $100,000. H. L. Blak Royal Oak, supt. Wks. and engr.

B. C. Victoria — ILLUMINATION, st Municipality, illumination 4 mi. Marine and permanent illumination centre of Be Hill Park with 100 ornamental stand and in business district replacing pre 5 light cluster with single unit or watt lamp, $199,100. G. M. Irwin, Hall, engr.

B. C., Victoria—WHARF—Municipality F. Hunter, clk., constructing wharf, $6 G. M. Irwin, City Hall, engr. CD 11/19— 11/25.

★**Newfoundland** — RAILROAD — Labr Mining & Exploration Co., Ltd., 21 St. James St., Montreal, Que., 240 mi. way from point on north shore of Gul St. Lawrence into the region. Over $5,4 000.

Sask., Melville — AIRPORT—Municipa airport. $150,000. Engineer in associa with Dpt. Transport, Ottawa, Ont.

CONSTRUCTION REPORTS

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WATER SUPPLY

PROPOSED WORK

Ill., Galesburg—Imprv. exten. reservoir. $220,000. A. O. Nordhielm, city engr.

†**Ill., North Chicago**—City, J. P. Dromey, mayor, City Hall, water distr. sys. $213,000. FWA. Alvord Burdick & Howson, 20 N. Wacker Dr., Chicago, engrs. CD 6/21—ENR 6/23.

Mont., Sunburst—City, survey and reports completed watermains. $70,000. Seeking FWA funds. Corwin & Co., Ford Bldg., Great Falls, engrs.

O., Akron—City, M. L. Davis, dir., Pub. Serv., City Hall, excav., back fill for 4,800 ft. water services and 5,200 ft. 6 and 8 in. watermains. W. R. Laude, City Hall, engr.

O., Bucyrus—City, R. H. Herzer, serv. dir., water filtration plant and pump. station, clear wells, 2 mi. 18 in. supply line, 14 mi. 6- to 16-in. distr. lines, 500,000 gal. elevated steel tank, $960,000. Applying for FWA funds. Floyd Browne & Assoc., Marion Bldg., engrs.

†**O., Cincinnati**—U. S. Eng., 522 U. S. Post Office and Court House, water testing laboratory at Columbia Parkway and Beechmont Levee, $375,000.

O., Deshler—Village, K. L. Baughman, clk., City Hall, completed plans installing zeolite water softening sys. $37,000. Finkbeiner, Pettis & Strout, Nicholas Bldg., Toledo, engrs.

†**Va., Newport News**—Water Works Comn., City Hall, preparing plans waterworks, Va. 44404. $70,000 FWA. E. H. Aldrich, 500 5 Ave., New York 18, N. Y., engr.

B. C., Kelowna—Glenmor Irrigation Dist., c/o R. W. Corner, P. O. Box 763, replacing wood pipelines. $22,874. W. R. Reed, P. O. Box 763, engr.

Ont., Bradford—West Gwillimbury Twp., c/o S. Kneeshaw, clk., Bradford, imprv. WW. $20,000.

Ont., King City—Municipality, WW sys. $50,000.

Ont., Rodney—Village, 5 mi. supply main from West Lorne to Rodney, elevated tank, service mains, etc. in Rodney, $100,000. C. R. Hagar Eng. Co., Fort Erie, N. Y., engrs. CD 5/18.

Ont., Sioux Lookout—Town, J. A. Bailey, clk., WW sys. James Proctor & Redfern, Ltd., Excelsior Life Bldg., Toronto, engrs.

Que., Beauport—Municipality, P. Grenier, clk., WW imprvs., exten. pump. sta. $15,000.

Que., Quebec City—City, F. X. Chouinard, clk., exten. WW sys. $110,000. Ed. Hamel, c/o owner, engr.

Que., St. Narcisse—Municipality, J. A. Clouthier, clk., water sys. $40,000.

Sask., Weyburn—Dpt. P. Wks., Regina, concrete reservoir, suction pipe, etc. at Mutual Hospital, $34,500.

Sask., Melville—Municipality in association with Prairie Farm Rehabilitation Bd., 810 McCallum Hill Bldg., Regina, water supply from Crooked Lakes in Qu' Appelle Valley. Over $75,000.

Sask., Weyburn—Provincial Govt., Regina, water supply sys., 24,000 ft. 12 in. pipe. $60,000. Dpt. P. Wks., Parliament Bldg., Regina, engrs.

BIDS ASKED

Bids Asked July 17

Pa., North East—Borough of North East, 10,326 ft. 12 and 16 in. watermain, etc. Plans deposit $5. H. Lewis Willert, borough secy. CD 4/13—ENR 4/27.

Que., Ste. Foy—Jos. Morin, secy., Municipality of Ste. Foy, exten. aqueduct and sewerage sys., 50,000 gal. reservoir. Over $15,-000. M. Gilbert, 5 Bois Joli St., Quebec City, engr.

Bids Asked July 20

Mont., Great Falls—City, W. P. Harrison, clk., City Hall, water supply project. Corwin & Co., 413 Medical Arts Bldg., consult. engrs.; adv. ENR 7/13.

Bids Asked July 21

†**Va., Newport News** — Newport News Waterworks Comn., City Hall, water distr. sys. addns., installing 19,400 ft. 6- to 16-in. c.i. pipe. Va. 44-404. $35,225. FWA. Plans deposit $5.

Bids Asked July 25

Fla., Tuscaloosa—City, F. G. Hocutt, clk., City Hall, water tower or tank of not less than 500,000 gal. capacity.

Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect-Engineer-Management type of contract

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings
Unclassified

Stages Reported

PROPOSED: (except Streets & Roads);
BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);
LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.
CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

†**Tex., Houston**—Federal Works Agency, 702 Electric Bldg., Fort Worth, Contr. 4, water distr. sys., incl. fittings, valves, appurtenances, Tex. 41-664-F, near here, for Harris Co. Fresh Water Dist. 5, Houston. $100,000. Plans deposit $25, J. C. Calhoun, Jr., Exchange Bldg., engr. CD 5/16—ENR 5/18.

Bids Asked July 27

Pa., Waynesboro—Burgess and Town Council of Borough of Waynesboro, A. Stover Fitz, secy., Municipal Bldg., water supply line, appurtenances from existing pipelines at crossing of Mentzer Rd. Plans deposit $15. Gannett, Fleming, Corddry & Carpenter, Inc., 600 N. Second St., Harrisburg, consult. engr.; adv. ENR 7/13.

Bids Asked July 27

N. Y., Newtonville—Latham Water Dist., Colonie, at Town Hall, Newtonville, filter bldg., softener bldg., salt storage tank, mixing basin, 2 filters, 2 softeners, controls, piping, valves, appurtenances. Plans deposit $25. Solomon & Keis, 257 Bway., Troy, N. Y., engrs; adv. ENR 6/13.

Bids Asked July 28

Md., Hyattsville—Washington Suburban Sanitary Comn., Hamilton St., 4,185 ft. 2- to 8-in. c.i. watermains and 6,775 ft. 6-to 10-in. vitr. sewers, etc. Contr. 175-W&S. Plans deposit $5. H. R. Hall, ch. engr.; adv. ENR 7/13.

LOW BIDDERS

†**Calif., Fontana** — U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, June 30, water and sewerage sys., at 155 mm shell plant (Kaiser), No. 637, from C. O. & W. J. Brand, P. O. Box 406, Riverside, $150,524.

Calif., Inglewood—City, June 30, 21062 lin. ft. 6- to 12-in. c.i. pipe and fittings (a) Class 150 (b) Class 250, from N. P. Van Valkenburgh Co., 3609 San Vicente Ave., Huntington Park (a) $71,900 (b) $79,900; from Hood Constr. Co., Huntington Park (b) $79,900.

†**Calif., San Bernardino**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, June 30, addnl. water supply, Army Airfield, No. 669, from Contracting Engineers Co., 2310½ N. Vernon Ave., Los Angeles, $34,267. Bids 6/30.

†**Calif., San Bernardino**—U. S. Eng., 751 S. Figueroa St., Los Angeles, design and construction elevated water tank, Army Airfield, Inv. 661, from Chicago Bridge & Iron Co., 116 New Montgomery St., San Francisco, $100,851.

†**Md., Bainbridge (sta. Port Deposit)**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., imprv. water supply, Naval Training Station, NOY 9226, from James N. Driscoll, 18 W. Chelton Ave., Phila., Pa., $158,000. CD 6/26—ENR 6/29.

Tex., Houston—City, M. H. Westerman, secy., City Hall, June 28, 18,900 ft. 12 in. c.i. watermains in Price, Hardy and Hollingsworth Sts., and 3,900 ft. 8 in. in Magnolia and Hays Sts., from Carey W. George, 1600 Midway Ave., Mobile, Ala., using lead joints $56,668, using mechanical joints $55,-669. J. Dannenbaum, Houston, Water Dpt., engr.

Tex., Mesquite—N. E. Shanda, mayor, City Hall, June 27, water distr. sys. exten., from Midwest Contg. Co., 403 S. Haskell St., Dallas, $16,080. Koch & Fowler, Great National Life Bldg., Dallas, engrs. CD 6/21.

Wis., Lake, (P. O. Milwaukee)—Town, June 30, drilling well, from S. B. Geiger & Co., 37 N. Van Buren St., Chicago, Ill., $36,-375. CD 6/20—ENR 6/22.

CONTRACTS AWARDED

Ark., Little Rock—Little Rock Municipal Waterworks, exten. distr. sys., 8- to 24-in. pipe, own forces. $100,000. John P. Powers, City Hall, city engr.

†**Fla., Carrabelle**—City, City Hall, imprv. WW and sewerage sys., Fla. 8-300, to J. B. Green Plumbing & Equip. Co., and Murray-Cook Co., Carrabelle, $173,670. FWA. Bids 5/31, awarded 6/17. CD 5/32—ENR 5/25.

†**Fla., Ellyson Field (br. Pensacola)**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., elevated water tank, NOY 9989, to Chicago Bridge & Iron Co., P. O. Box 272, Birmingham, Ala., $117,711.

†**Fla., Lynn Haven**—City, imprv. WW sys., Fla. 8-289, to Paul Smith Constr. Co., 320 Rome Ave., Tampa, Zone 1. Est. $19,850. FWA. Bids 6/15. Smith & Gillespie, Packard Bldg., Jacksonville, Zone 2, engrs. CD 1/6—ENR 1/13.

†**Fla., Tampa**—City, imprv., exten. WW sys., Fla. 8-291, to Loftis Utilities Constr. Co., c/o City Engineer, Tampa, $190,000. FWA. Robert & Co., Bona Allen Bldg., Atlanta, Ga., engrs.-archts. CD 4/19—ENR 4/27.

†**Ind. Crane**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., water and sewer lines, Naval Ammunition Depot, NOY 9924, to Birmingham Contg. Co., 208 Hanna Bldg., Birmingham, Mich., $59,647.

†**Neb., Fort Crook**—U. S. Eng., 1709 Jackson St., Omaha, water supply wells, to Layne-Western Co., World Herald Bldg., Omaha, $44,000.

†**Pa., Aspinwall (br. Pittsburgh)**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash. 25, D. C., 1 story, 32x42 ft. brick, cast stone water treatment plant, to Navarro Corp., 6219 Broad St., Pittsburgh, $30,500. Bids 6/27. CD 6/7—ENR 6/8.

Tex., Crowell—Town, J. P. Davidson, secy., WW imprvs. to Panhandle Constr. Co., Lubbock, $86,000. H. N. Roberts, 2415 20 St., Lubbock, engr. CD 6/16—ENR 6/22, under LB.

Ont., Malton—Victory Aircraft Ltd., Malton, rein.-con. reservoir, to Ontario Constr. Co., Ltd., Box 36, St. Catherines, about $25,-000. Owners staff and Ewart, Armer & Byan, 26 Toronto St., Toronto, engrs.

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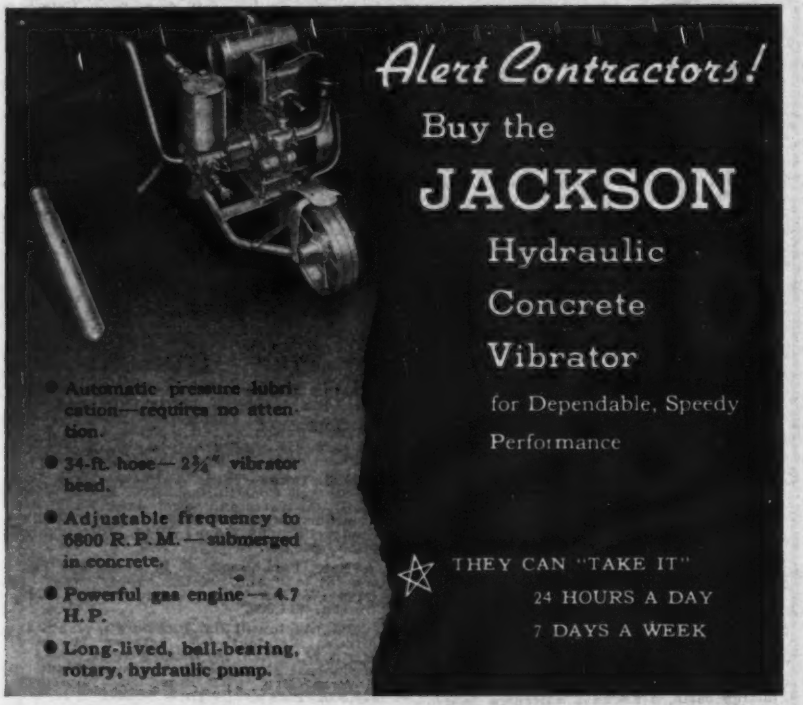

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WATER SUPPLY (Contracts Awarded Cont'd.)

Que., Huntingdon—Town, water line from pumphouse to No. 4 Recuperating Centre, to W. H. Kelly, 1434 St. Catherine St. W., Montreal, $19,000.

Que., La Tuque—Braun Corp., La Tuque, pump house and equip., to Foundation Co. of Canada, Ltd., 1538 Sherbrooke St. W., Montreal, $24,400.

Que., Montreal—Dpt. National Defence (Army), Ottawa, Ont., 8 in. Class C water pipe at Jacques Cartier Barracks, No. 1 Military Dist., to W. H. Kelly, 1434 St. Catherine St. W., $17,000.

Que., Mont Rolland—Municipality, c/o J. Beauchamp, clk., replacing wood mains with 6 and 8 in. c.i. pipe, to W. H. Kelly, 1434 W. Ste. Catherine St., Montreal, $63,000. Gohier & Dorais, 10 E. St. James St., Montreal, engrs.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

†**Miss., Gloster**—City, M. V. Caulfield, mayor, City Hall, bids soon sewer facilities. Miss. 22-027-N. $85,000. FWA. J. Wesley Brown, McComb, engr.

Mass., Springfield—City, Street Dpt., making plans sewers, pump. station. $30,000.

Pa., New Kensington—City, L. G. Hemphill, clk., City Bldg., making plans & [illegible] storm sewer. $60,000. R. M. Douglas, City Bldg., engr.

Tenn., Manchester — City, T. E. Gay, mayor, City Hall, sewerage sys. Applying for FWA funds.

★**Tex., Fort Worth**—S. H. Bothwell, city mgr., City Hall, enlarging sewage treatment plant. $703,630. Applied for FWA funds. Freese & Nichols, Cappe Bldg., engrs. CD 9/13—ENR 9/23.

Tex., Houston—City rejected bids June 9 for sanitary sewer lines, appurtenances in Grigsby Rd., etc.

Ont., Ravenswood—Secy. Dpt. National Defense (Army), Ottawa, bids soon sewage disposal plant and water intake from Lake Huron to Camp Ipperwash, No. A-39 A.7. $40,000.

Ont., Toronto—Etobicoke Twp. plans prepared sewerage sys. sewage disposal plant. $327,000. F. M. McArthur, c/o owner, engr.

Que., Lasalle (Postal Dist. Montreal)—Town, A. Gravel, clk., sewers. $30,000. Latour, Town Hall, engr.

Que., Quebec City—City, F. X. Chouinard, clk., collecting sewer. $153,400. Ed Hamel, c/o owner, engr.

Que., Rawdon—Town, E. Pepin, mayor, Miss T. Preville, secy., sewerage sys. $[illegible]000. Gohier & Dorais, 10 St. James St., Montreal, engrs.

Sask., Regina—Municipality, c/o G. Beach, clk., storm sewer along Victoria Ave. boulevards from Broad St. through Pasqua St., without outlets to Creek. $350,000. D. A. R. McCannel, City Hall, engr.

BIDS ASKED

Bids Asked July 17

†**Me., Portland**—Federal Works Agency, 6 Chauncy St., Boston, Mass., intercepting sewers, Bishop St. and Warren Ave., [illegible] 17-163. Plans deposit $10 ea. set. J. Gardner, 57 Exchange St., engr. CD 6/1[illegible] ENR 5/18.

†**Md., Bethesda (br. Wash., D. C.)**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., expanding incinerator facilities, National Naval Medical Center, NOY 10282.

Bids Asked July 18

Ind., Fort Wayne—Bd. P. Wks., R. Beams, chn., City Hall, 1¼ mi. 12- to 43-in. vitr., concrete and rein.-con. intercepting sewer, Beaver Area, S. Wayne St., Oakdale, Ft. Wayne. Revised cost $100,000. City Utilities, 303 E. Berry St., engr. CD 6/[illegible]—ENR 6/29.

Bids Asked July 20

Mass., Newton—Street Comrs. Office, 1[illegible] Commonwealth Ave., sanitary sewers, Private Way, Dudley Rd. and Brookline Sts. sections. $25,000. E. H. Harvey, city engr.

Bids Asked July 21

†**Utah, Magna**—R. Boden, chn. Bd. Comrs., Salt Lake Co., City and County Bldg., Salt Lake City, 30,000 ft. 8- to 16-in. sanitary sewer lines, $169,000. FWA. C. L. Ulrich, 423 Ness Bldg., Salt Lake City, engr. 3/6—ENR 3/9.

LOW BIDDERS

†**Calif., Los Angeles**—Los Angeles Co. Sanitation Dist., 110 S. Bway., July 5, sanitary sewer in Lennox-Laundale-Gardenia Area, Unit 1, Calif. 4-613-F, from Burch & Bell, 5063 S. Bway., $128,030. FWA. Bids [illegible] rejected. CD 6/16—ENR 6/22, under LB.

Ill., Chicago—Sanitary Dist. of Chicago, 910 S. Michigan Ave., June 29, altering [illegible] door substation, West Side Sewage Treatment Works, Contr. 44-12(WS-E), [illegible]

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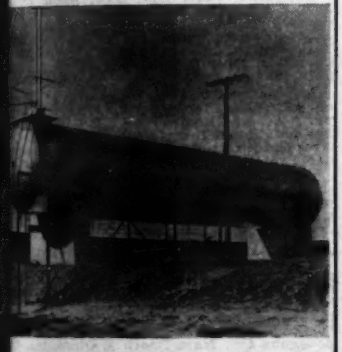

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SEWERS, WASTE DISPOSAL (Low Bidders, Cont'd.)

Monroe Electric Co., 228 N. La Salle St., **$81,901**; Calumet Sewage Treatment Works, Contr. 44-34(CL-P), from John C. Tulley & Co., 33 N. La Salle St., **$92,772.**

Ia., Oelwein—City, June 27, sewage plant, from John Lippert, Oelwein, **$29,500.** CD 6/21.

Minn., Fosston—Village, June 26, sewage treatment plant, from J & J Contractors, J. J. Nagel, Perham. **$37,135.** CD 6/14.

Wash., Seattle—City, County-City Bldg., sewer in 55 Ave. N.E., etc., from Valley Constr. Co., Northern Life Tower, **$206,560.**

CONTRACTS AWARDED

†**N. Y., Brooklyn**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., addnl. incinerator, incinerator plant, NOY 9884, to Frederick W. Daelber Co., 157 E. 25 St., New York, **$45,000.**

†**N. Y., Sampson**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., sludge digester, Naval Training Station, NOY 9842, to A. Friederich & Sons Co., 710-12 Lake Ave., Rochester, Zone 13, **$56,785.**

†**Va., Quantico**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., repairing, imprv. sewers, Marine Barracks, NOY 8348, to W. C. Spratt, Fredericksburg, **$99,800.**

Wash., Seattle—City, County-City Bldg., View Ridge Sewers, to Valley Constr. Co., Northern Life Tower. **$206,560.** Awarded 7/6. CD 2/29—ENR 3/2.

BRIDGES

PROPOSED WORK

Missouri—State Hy. Comn., Jefferson City, one 80 ft. and two 70 ft. I-beam spans, 2 concrete piers, Route SC (2), Proj. FAS 498B2, Johnson Co., over $25,000; two 70 ft., two 60 ft. and two 39 ft. I-beam spans, 5 concrete piers, timber piling, Route SH-Proj. FAS 574A2, Gentry Co., over $25,000; underpinning 4 bents of approach with steel piling to rocks over Missouri River, Route 71, Jackson Co., over $25,000; one 49 ft. and four 43 ft. I-beam spans, Route SM, Franklin Co., over $25,000. C. W. Brown, ch. engr.

O., Cleveland—City, S. F. David, dir. Pub. Serv., City Hall, making plans rein.-con. strengthening Washington Park Bridge, $30,000. J. M. Heffelfinger, 518 City Hall, bridge engr. CD 6/23—ENR 6/29.

Wis., Medford — Taylor Co. Hy. Comn., Medford, rejected bids June 5, construct'ng Alberts Bridge, Co. Proj. 6504, on Hy. Hat Jump River, $40,000-$50,000. W. C. Miller, Medford, engr. CD 6/13—ENR 6/15.

BIDS ASKED

Bids Asked July 18

Maryland—State Roads Comn., Baltimore treated timber pile bridge over Pocomoke River at Pumell's Crossing, Contr. Wi. 206-1-111, Wo. 246-1-111, Wicomico and Worcester Counties.

West Virginia—State Road Comn., Charleston, substructure and south half of superstructure Lewis Overhead 1649, one 45 ft. I-beam, two 70 ft. and one 113 ft. continuous steel beam spans, near St. Albans, SN FAG H 249-A(3); concrete substructure only St. Albans Bridge 1585, across Coal River, 5 span continuous steel girder, overall 579 ft., SN FA 249-C(1); south half of superstructure only St. Albans Bridge 1585, all Kanawha Co. D. McClaugherty, secy.

Quebec—Province of Quebec, Quebec City, bridge over River Rouge, in Labelle, $30,000. O. Desjardins, Dpt. P. Wks., Quebec City, engrs.

LOW BIDDERS

Illinois—State Div. Hys., Springfield, 3 rein.-con. box culverts, etc., Cook Co., from M. J. McDermott & Co., 30 N. La Salle St., Chicago, **$31,443.** Bids 6/29.

Pennsylvania—State Dpt. Hys., Harrisburg, July 6, painting 4 bridges, Armstrong and Westmoreland Counties, from Landis Spanos Painting Co., 2908 W. Liberty Ave., Pittsburgh, **$29,150.** CD 6/26, under Roads.

CONTRACTS AWARDED

O., Cincinnati—Repairing Grandin Rd. viaduct, replacing certain structural steel members, new concrete pavement, drains, etc., to La Crosse Dredging Corp., 1522 W. 3 St. **$52,000.** Est. $56,000. Awarded 7/3. H. H. Kranz, City Hall, engr.

Utah—State Rd. Comn., Salt Lake City, 273 ft. span continuous concrete T-beam overpass, Box Elder Co., to S. E. Faddis, 271 Edison St., Salt Lake City, **$57,090;** approach roads, to Olof Nelson, Logan. **$66,967.** Bids 6/23. CD 6/16.

Quebec—Dpt. P. Wks., Quebec City, repairing Gouin Bridge over Richelieu River, between St. Johns and Iberville, to Grant Mills, Ltd., 5314 York St., Montreal, approx. **$90,000.**

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BRIDGES (Contracts Awarded, Cont'd.)

Que., Montreal (Verdun)—City of Montreal, repairing Ahuntsic Bridge, Lajeunesse St. near Blvd. Gouin, to Concrete Engineering, Ltd., 2049 Harvard Ave., $61,950.

STREETS AND ROADS

BIDS ASKED

Bids Asked July 17

Mass., Jamaica Plain—City of Boston, P. Wks., 508 City Hall annex, bituminous concrete paving Lockstead Ave., Brewer, Bishop, Gordon, Sherwood, Plainfield and Thomas Sts. $28,000.

†Virginia—Pub. Roads Admin., 18 and F Sts. N.W., Wash. 25, D. C., addnl. access road to Arlington Hall Station, Proj. VA-D 9 WR 38, Arlington Co. Plans deposit $10.

Bids Asked July 19

Louisiana—State Dpt. Hys., Baton Rouge, shaping roadway, gravel surfacing, draining 151.7 mi. S.P. 737-00-02 (Contr. 2) Defense Access Army Reservation Project DA-WR 500, Natchitoches Parish; 17.6 mi. S.P. 737-00-03 Contr. 3, Defense Access Reservation Project DA-WR 500(1) Rapides Parish.

Mass., Boston—City, P. Wks., sheet asphalt paving Beach, Blackstone, Central, Federal, Oak, State and Union Sts. $40,000. Plans deposit $2.

Mass., Jamaica Plain—City of Boston, P. Wks., 508 City Hall annex, bituminous concrete paving Union Ave., Galena, Ophir and Sylvia Sts. $25,000.

Mo., Clayton (St. Louis, P. O.)—St. Louis Co., c/o Walter E. Miller, clk., Court House, imprv. Lavinia Ave., Musick Ave. to Tesson Ferry Rd., grading, draining, etc., bituminous treating, bituminous seal coating Ambs, Becker, Continental, Fee Fee, Kennerly, Lackland, New Jamestown, Old Ballwin, Old Florissant, Price and Union Rds., Bobring, Degenhart, Florissant, Gilrose, Hord and Waller Aves. Over $25,000. R. Jablonsky, Court House, co. hy. engr.

Bids Asked July 20

Iowa—Bd. Supervs. Boone Co., grading, culverts, 72,000 cu. yd. earth excav., 345 cu. yd. concrete masonary, 29,981 lb. reinforcing steel, etc. Colfax and Pilot Mound Twps. $25,000. P. Saum, Boone, co. engr.

Bids Asked July 24

Ia., Grundy Center—Bd. Supervs. Grundy Co., graveling 40 mi. secondary roads. J. W. Wiersma, Grundy Center, co. engr.

Minnesota—State Hy. Dpt., Dist. Office, Owatonna, crush, screen, load, haul 44,540 cu. yd. gravel, production of mineral aggregate for traffic-bound wearing course and for stockpiles, for Maintenance Division. $30,000. O. L. Kipp, ch. engr.

Bids Asked July 26

Delaware—State Hy. Dpt., Dover, macadam base and bituminous surface 0.278 mi. Marsh Rd., Contr. 869, New Castle Co. W. W. Mack, ch. engr.; adv. ENR 7/13.

Bids Asked July 28

Kentucky—Dpt. Hys., Frankfort, grading, draining 5.856 mi. Louisa-Paintsville Rd., beginning at end of improved surfacing and exten. toward Paintsville, FA 78 A(4), SP 64-53; 5.123 mi. Louisa-Paintsville Rd. beginning at end of FA 78 A(4) approx. 14 mi. south of Louisa and exten. toward Paintsville to Johnson Co. line, FA 78 A(5), S.P. 64-53, both Lawrence Co.; 0.842 mi. Centertown-Island Rd., beginning east of Point Pleasant and exten. to Green River at Point Pleasant and opposite Island, S.P. 82-304, Ohio Co.; high type surfacing 3.144 mi. Williamsburg-Jellico Rd., beginning ¾ mi. north of Tennessee Line and exten. to point opposite Saxton, SN-PA 23 B (3), S. P. 118-100, 118-260, Whitley Co.; grading, draining, low type surfacing 4.619 mi. Morgantown-Brownsville Rd. beginning at junction with Ky. 105 approx. 1¼ mi. north of Aberdeen and exten. to near Huldeville. SP 16-116, Butler Co.; 0.919 mi. Upton-Clarkson Rd., at Millerstown, SP 43-75, Grayson Co.; bituminous surfacing 16.554 mi. Manchester-Hyden Rd., beginning at Ky. 21 approx 1 mi. south of Manchester and exten. to Leslie Co. line, SP 26-45 Clay Co.; 20.46 mi. Manchester-McKee Rd., beginning at Burning Springs and exten. to Courthouse in McKee, SP 26-5, SP 56-29, Clay and Jackson Counties; 13.304 mi. Hyden-Manchester Road beginning at Hyden and exten. to Clay Co. Line, SP 66-53, Leslie Co.; bituminous resurfacing 14.994 mi. Morganfield-Wanamaker Road, beginning at Morganfield and exten. to US 41 near Wanamaker, RP 113-127, RP 117-449, Union and Webster Counties; 9.717 mi. Georgetown-Williamstown Rd., beginning approx. 3 mi. north of Georgetown and exten. to Corinth, MP 105-14-E, 105-14-I, Group 25, Scott Co.; addn. sidewalk and strengthening bridge over Cumberland River near Loyall, Harlan-Pineville Rd., S.P. 43-168, Grayson Co.; repairing concrete pavement (patches) on Covington-Lexington Rd., from Covington to Boone Co. line, incl. C&O bridge approach and on Florence-Warsaw Rd., from Florence to near Beaver, Group 2-C, Boone and Kenton Counties.

Bids Asked

Nebraska—State Dpt. Rd. & Irrigation, Lincoln, received no bids June 29, imprv. Crete-Dorchester, Patrol 19026, Saline Co.; rejected bids June 29, imprv. Red Willow and Hitchcock Counties. CD 6/22.

Ohio—State Hy. Dpt., Columbus, rejected bids June 27, imprv. 0.976 mi. Greene Co. CD 6/20—ENR 6/22.

Texas—State Hy. Comn., Austin, rejected bids June 22, imprv. 0.426 mi. Grayson Co., $20,000. CD 6/13—ENR 6/15.

Tex., Houston—City, rejected bids, June 14, stabilized shell base and asphalt topping in Broadmoor addn., etc. CD 6/21—ENR 6/22, under LB.

LOW BIDDERS

†California—Pub. Rd. Admin., 720 Phelan Bldg., San Francisco, 0.068 mi. access road, South Fork Eel River Bridge serving Rockport Redwood Co. and Juan Creek Lumber Co., Proj. DA-RM 219 (2), Mendocino Co., from Fred J. Maurer & Son, 369 Pine St., San Francisco, $67,842.

California—State Div. Hys., Sacramento, June 28, imprv. 8.5 mi. Monterey Co., from Granite Constr. Co., c/o Post Office, Watsonville, $182,435; about 8 mi. Sacramento, Placer and Yolo Counties, from McGillivray Constr. Co., P. O. Box 873, Sacramento, $27,386. CD 6/12—ENR 6/15.

California—State Div. Hys., State Bldg., Los Angeles, June 29, imprv. 43.8 mi. San Bernardino Co., from R. R. Hensler, 111 Allen Ave., Glendale, $57,175; 9.6 mi. Los Angeles and Orange Counties, from Sully-Miller Contg. Co., 1500 W. 7 St., Long Beach, $44,667. CD 6/12—ENR 6/15.

California—State Div. Hys., Sacramento, July 5, imprv. 8.2 mi. Contra Costa and Alameda Counties, from A. J. Raisch, 6 Kearny St., San Francisco, $58,311. G. T. McCoy, state hy. engr. CD 6/19—ENR 6/22.

Ill., Alton—City, June 26, imprv. 1.2622 mi. Proj. 27-CS, from Hartong & Co., 37 W. La Salle St., Chicago, $58,625. CD 6/21.

Ill., Joliet—City, June 26, sheet asphalt paving 0.7665 mi. Proj. 19-CS, from Warren Oil Co., Inc., North Bway., $35,671. H. C. Simpson, city engr.

Ill., Rockford—City, June 21, imprv. 2.941 mi. Proj. 70-CS, from Geneva Constr. Co., 111 Downer Pl., Aurora, $35,525. CD 6/13—ENR 6/15.

Ill., Peoria—City, June 27, concrete paving 0.15 mi. Proj. 12A-4-C6, from Clark Bros. Co., 724 Kansas St., $47,320; maintenance, general street repairs from Otis Williams, 704 East Republic St., $37,173. CD 6/21—ENR 6/22.

Indiana—State Hy. Comn., Indianapolis, July 7, imprv. 5.617 mi. Allen Co., from Moellering Constr. Co., 241 Murray St., Fort Wayne, $385,863. CD 6/29.

Louisiana—State Dpt. Hys., Baton Rouge, July 5, imprv. 86.2 mi. Rapides Parish, from Corruth Contg. Co., Louisiana Natl. Bank Bldg., Baton Rouge, $52,121; 0.699 mi. St. Tammany Parish, from Newsom Bros., Columbia, Miss., $144,553. CD 6/26—ENR 6/29.

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., Boston, July 5, imprv. Access Road Proj. DA-WR 29, in Framingham, from San Vel Contr. Co., Ayer Rd., Littleton, $39,594. CD 6/20, under Framingham.

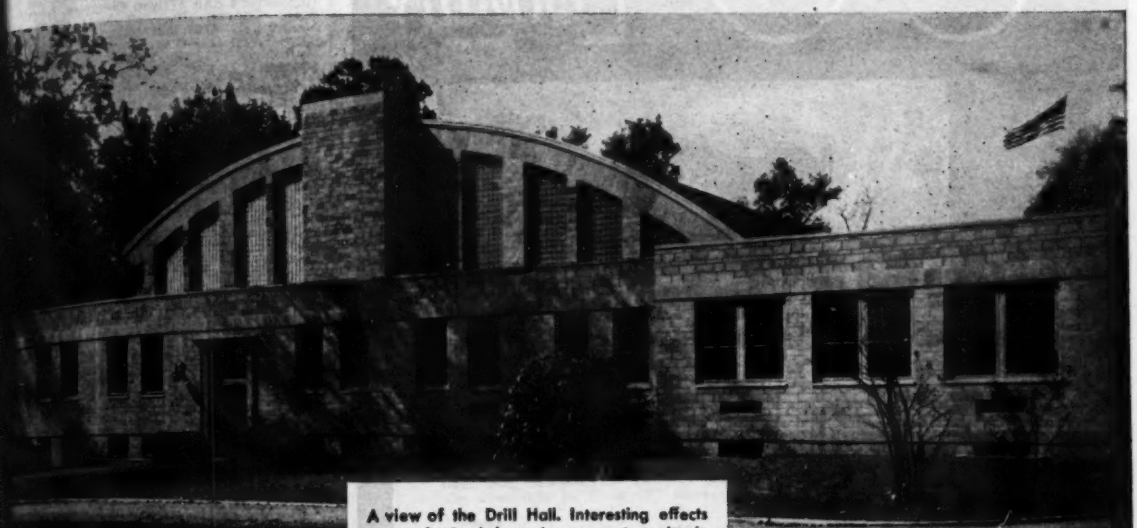
Minnesota—State Hy. Dpt., St. Paul, June 30, imprv. 10.9 mi. S.P. 0202-15 (Trunk Hy. 10-3) and S.P. 7101-22 (TH 10-3), from Megarry Bros., St. Cloud, $134,924. CD 6/14—ENR 6/22.

★ **Nebraska**—State Dpt. Rd. & Irrigation, W. G. Scott, engr., Lincoln, June 29, imprv. 13.8 mi. Lancaster and Saline Counties, from Peter Kiewit Sons Co., 1204 Omaha National Bank Bldg., Omaha, $127,251***10.6 mi. Saline Co., from Yant Constr. Co., 917 N. 45 St., Omaha, $151,517***10.3 mi. Cheyenne Co., from Booth & Olson, Inc., 621 Insurance Exchange Bldg., Sioux City, Ia., $515,844; 11.8 mi. Cheyenne Co., from Northwestern Eng. Co., Rapid City, S. D., $616,524***4.6 mi. Deuel Co., from Roberts Constr. Co., 1018 Terminal Bldg., Lincoln, $199,085***5 mi. Lancaster and Otoe Counties, from Lee & Johnson, Inc., 215 Insurance Exchange Bldg., Sioux City, Ia., $50,883. Rejected bids June 30, imprv. 14 mi. Red Willow and Hitchcock Counties. CD 6/22.

North Carolina—State Hy. & P. Wks. Comn., Raleigh, July 6, imprv. 19.14 mi. Cabarrus and Rowan Counties, also 6.32 mi. Mecklenburg Co., from Blythe Bros. Co., 434 S. Brevard St., Charlotte, $85,245 and $52,668; respectively; est. $75,000-$100,000 and $50,000-$75,000 respectively. 1.35 mi. Wilson Co., from F. D. Cline, Fairview Rd., Raleigh, $43,842, est. $25,000-$50,000. CD 6/30.

Pennsylvania—State Dpt. Hys., Harrisburg, July 6, imprv. 3.03 mi. Cambria Co., from L. R. Owen, Johnstown, $72,193***1.92 mi. Bradford Co., from Hutchinson Contg. Co., Clifton Heights, $67,165***1.08 mi. Tioga Co., from Ryan Bros., Inc., Clearfield, $59,792***2.44 mi. Philadelphia Co., from Union Paving Co., Broad and Stiles St., Phila., $108,299. CD 6/26.

The Annapolis of the Merchant Marine"

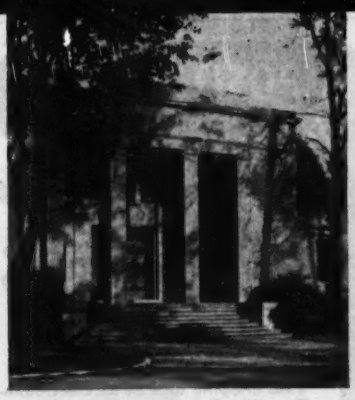


A view of the Drill Hall. Interesting effects were obtained by using concrete units in several different sizes and colors, laid with irregularly staggered joints.

the U. S. MERCHANT MARINE ACADEMY

uty, permanence and rapid con-
ction, in spite of wartime shortages
aterials, have been achieved in the
ding of the U. S. Merchant Marine
demy, Kings Point, Long Island.

buildings—18 in all—were de-
ed by Alfred Hopkins and Asso-
es, Architects and Engineers, and
cted under the supervision of the
Shipping Administration. Some
buildings were also remodeled. The
milya Brown Company was the con-
tor. Masonry units were supplied by
ional Brick Corporation and ready-
concrete by the Island Transit Mix



A successful combination of concrete units and cast stone trim is seen in this entrance to the Drill Hall. All masonry units were made with Lehigh Early Strength Cement.

Concrete Company.

Much of the general construction work was done with Lehigh Normal Cement. Lehigh Early Strength Cement was used in the manufacture of approximately one million cinder concrete blocks and exterior colored concrete masonry units. By using this quick-curing cement in the manufacture of these blocks and units, the National Brick Company found that breakage was held to a minimum and blocks and units could be transferred to the high pressure steam chambers much more quickly, saving time and money.

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built to last . . . with
speed and economy . . . use

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THE gripping unit in an Electroline-Fiege Wire Rope Connecter holds like a Bulldog because it has a "Positive Grip". The holding compression is graduated from front to rear so that danger of crystallization, due to vibrations, is eliminated. Frayed strands and early failures are avoided.

Many other advantages, such as greatly increased wire rope life, elimination of hazards to workmen, etc., have made these connectors first choice for dependable results. Let us send you an interesting booklet, "Positive Grip". It will give you complete performance data on this easily installed, better and more economical streamlined connector. Write today.

Electroline FIEGE CONNECTORS

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4121 South La Salle Street — Chicago, Illinois

STREETS & ROADS (Low Bidders, Cont'd.)

Tennessee—State Hy. Dpt., Nashville, June 30, imprv., S.A.P. 576, Macon and Sumner Counties, also S.A.P. 577, Trousdale, Putnam, Smith and Sumner Counties, from R. B. Tyler Co., 1446 Levering St., Louisville, Ky., $129,048 and $162,091 respectively•••S.A.P. 578, De Kalb, Rutherford and Wilson Counties, from Intas State Constr. Co., 3rd Natl. Bank Bldg., Nashville, $163,353•••S.A.P. 579, Cannon, Rutherford and Warren Counties, from H. E. Williams, 1826 S. 7 St., Louisville, Ky., $66,902. CD 6/5—ENR 6/15.

Virginia—State Hy. Dpt., Richmond, June 6, imprv. 0.531 mi. Stafford Co., from Blackwell Engr. & Constr. Co., Warrenton, $32,5••••2.93 mi. Amelia Co., from Perkins-Barr Constr. Co., Inc., Blackstone, $80,191•• 1.078 mi. Russell Co., from W. E. Graham & Sons, Cleveland, N. C., $345,710. C 6/26—ENR 6/29.

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, imprv. 28.03 mi. Choctaw and Marengo Counties, to Carleton Constr. Co., Albany, Ga., $36,360; 16.67 mi. Green Co., to Cre Constr. Co., Dothan, $33,173. Bids 6/21. C 6/21.

★†**Ariz. Belimont**—U. S. Eng., 751 Figueroa St., Los Angeles, 14, Calif., add'l. road at Navajo Ordnance Depot, to Bosich Brothers, 600 South Freemont Ave., Alhambra, Calif. $1,325,000.

Calif., Bakersfield—Kern Co., Court House, 159,230 sq. yd. mix shape and compact ma facing Inyokern-Trona Rd., to Clyde W. Wood, 816 W. 5 St., Los Angeles, $33,3

†**Del., New Castle**—U. S. Eng., 6 and Wa nut Sts., Phila., Pa., paving and roadwo to Wilson Contracting Co., Inc., New Cas $83,306. Awarded 6/20.

Florida—State Rd. Dpt., Tallahass imprv. 7.908 mi. Duval Co., to Duval En & Contr. Co., foot of E. Adams St., Jacksonville, $31,674•••12.541 mi. Palm Beach Co to Brinson Constr. Co., Caesar and Cumb land Rds., Tampa, $197,575•••2.249 mi. Po Co., to Nolan Dickerson Constr. Co., Lak land, $31,194•••19.001 mi. Hillsborough Co to W. H. Armston & Co., Inc., Dunedi $87,403•••19.001 mi. Hillsboro Co., to R. Tyler Co., 1446 Levering St., Louisville, K $110,074. Grand total $457,920. Bids 6/ CD 5/31.

Ia., Cedar Rapids—Bd. Supervs. Linn C surfacing secondary roads, to Concrete Ma terials & Constr. Co., 405 Granby Bld $26,061. Bids 6/20. CD 6/12—ENR 6/15.

Ia., Pocahontas—Bd. Supervs. Pocahont Co., gravel surfacing various secondar roads, to Bagley Constr. Co., Bagley, $36,4 Awarded 6/16. A. L. Thornton, Pocahont engr.

†**Kan., Olathe**—Yards & Docks, Navy Dp 18 St. and Constitution Ave. N.W., Was 25, D. C., resurfacing, reconditioning bi top roads and mat, Naval Air Station, NO 10235, to Reno Constr. Co., Inc., 5401 M rian Blvd., Kansas City, $29,150. CD 4/1 ENR 4/27, under Unclassified.

†**Ky., Louisville**—U. S. Eng., 612 Fede Bldg., Louisville, access drives, Contr. 129-Eng-505, to Andrews-Collings Asph Co., 13 and St. Louis Sts., $28,902.

La., Alexandria — Asphalt paving 30,0 sq.yd. streets, to Flynn Mfg. Co., Alexand $1.80 sq.yd. Est. over $25,000. Bids 6/ CD 6/13.

†**Mass., South Boston**—U. S. Eng., 31 James Ave., Boston, concrete paving a track construction, No. 19-023-44-Neg-2 to C. J. Maney Co., Inc., 24 Dane St., Somerville, $42,638. Est. $40,000. CD 7/5—E 7/6.

Missouri—State Hy. Comn., Jefferson C imprv. 0.717 mi. Phelps Co. and 1.73 Pulaski Co., to O'Dell & Riney Constr. C Hannibal, $126,214 and $324,653 respectiv CD 6/20—ENR 6/22, under LB.

North Dakota—State Hy. Dpt., Bismar imprv. 3.5 mi. U. S. Hy. 85, WER 4, Kenzie Co., to Archie Campbell, Warw $234,594. 12.3 mi. FAP 87(2) and 43 Bottineau Co., to Northern Improvement Fargo, $138,268. Bids 6/30. Rejected June 20, imprv. 19.3 mi. SN-FAP 279B and 297(A) 18.4 mi. SAP 56 GH and 29 both Stutsman Co.; 8.4 mi. SAP 337 B (P 106, 219D, 219C and 304 A (Pt.), Pierce C 19.1 mi. SAP 350D, 346 D and 425 B, Kenzie Co. CD 6/20—ENR 6/22.

O., Lancaster—Fairfield Co., resurfac 65.03 mi. hy., to Geo. W. Van Camp, Cir ville, $29,589. Est. $30,000. Awarded 6/

†**Pa., Hog Island (P. O. Phila.)**—U. Eng., Penn Mutual Bldg., 6 and Wal Sts., Phila., new access road and surfac roads, Contr. 36-109-Eng-693, to Seabo Constr. Co., 17 and Sansom Sts., Ph $53,893.

★**Tennessee**—State Hy. Dpt., Nashville, prv. 27.3 mi. Davidson and Wilson Co ties, to Eller & Olsen, 32 Ave. N, Nashv $700,026; 23.6 mi. Wilson and Smith Count to H. E. Wolfe Constr. Co., and J. Michael & Co., 1021 Haywood St., Memp $783,585. CD 7/5, under LB.

STREETS & ROADS (Contracts Awarded, Cont'd.)

Virginia—State Dpt. Hys., Richmond, improv. Route 165, city of Norfolk, to B. W. Dickson Contg. Co., 1909 West Graham Rd., Richmond, $54,545. Bids 6/29. CD 6/20—ENR 6/22.

Va., Morrison—U. S. Eng., Fort Norfolk, Norfolk, addnl. roads, railroad facilities, etc., Contr. 44-110-Eng-220, to Sutton, Co., Inc., Milford, $31,593.

Va., Quantico—Yards & Docks, Navy Dpt., M St. and Constitution Ave. N.W., Wash., D. C., road repair, Marine Barracks, NOy 10195, to Heising Bros., Woodward Bldg., 15 and H Sts. N.W., Wash., D. C., $7,166.

Washington—State Hy. Dpt., Olympia, impv. 16.2 mi. King Co., to L. Coluccio Const. 612 21 Ave. S., Seattle, $26,971. Bids 6/27. CD 6/13—ENR 6/15.

Washington — B. Bantz, dir. State Dpt. Hys., Olympia, imprv. Sect. 1, Primary State Hy. 1, Sect. 3, Primary State Hy. 22, Stevens Co., and Sect. 5, Primary State Hy. 6, Pend Oreille Co., and Sect. 4 Secondary State Hy. 29, Lincoln Co., to Joslin & Mc Allister, N. 1 Haven Ave., Spokane, $38,925. Bids 7/6. CD 6/22—ENR 6/29.

West Virginia—State Road Comn., imprv. 2 mi. Harmon-Red Creek Rd., and 27.05 mi. Elkins-Harman Rd., Randolph Co., to Shirley Constr. Co., Morgantown, $33,834 and $69,033 respectively. Bids 6/27. CD 6/21—ENR 6/22.

B. C., Delta—Town, repairing, surfacing 6 mi. road between Lodner and New Westminster, to E. B. Taylor Constr. Co., Ltd., 1191 Hudson St., Vancouver. About $35,000.

Man., Winnipeg—Concrete paving Arlington St. to tracks also Fleet St. Lane to Pembina Hy., day labor, $39,781

New Brunswick—Provincial Govt., Fredericton, grading, turnpiking, graveling road, Harcourt, to Rayner Constr. Co., Ltd., 21 Queen St., Moncton. Est. $60,000. Dpt. P. Wks., Fredericton, engrs.

N. S., Deepbrook—Dpt. National Defense (Navy), Ottawa, Ont., paving, constructing roads at H.M.S. Cornwallis, to Standard Paving Maritime, Ltd., Lady Hammond Rd., Halifax, $138,000. Bids 5/30. CD 6/24.

Ont., Perth—Lanark Co., reconstructing road, to Holdcroft Constr. Co., Ltd., 355 Princess St., Kingston, and T. S. Kelly, Smith Falls. Est. $30,000. W. L. Dickson, County Bldg., engr.

Que., Quebec—Dpt. Roads, Quebec City, paving 9 mi. Hy. 15 between Chateau Richer and St. Anne De Beaupre, to Union des Carriers & Pavages Cie. Ltd., 48 Second Ave., Quebec City, about $250,000. E. Gohier, c/o owner, engr.

EARTHWORK, WATERWAYS

PROPOSED WORK

Ill., Ottawa—State Div. Waterways, 201 E. Monroe St., Springfield, constructing Ottawa sea wall at State Armory Bldg. Over $50,000. Thos. B. Casey, ch. engr.

Neb., Nebraska—Twin Valley Irrigation Assn., W. F. Spikes, pres., St. Paul, irrigation canals for 59,000 acres land, incl. dam, reservoir, Greeley, Howard, Merrick and Nance Counties. Over $500,000.

N. C., Marshall—French Broad Electric Membership Corp., Marshall, cancelled bids to have been opened June 29, approx. 550 l. concrete retaining wall, N.C. 46-G Madison (REA). New bids soon. J. B. McCrary Eng. Corp., Marietta St., Atlanta, Ga., engrs.

O., Bay Village—Village, G. L. Ganyard, Pres. Town Hall, erosion elimination along Lake Erie. $70,000. Wm. Sutcliffe, c/o Owner, village engr.

O., Cleveland—City, S. F. David, dir. Pub. Serv., City Hall, bulkhead and jetties along Lake Erie between Euclid Creek and Nett Rd. $80,000. J. C. Wenrick, 518 City Hall, City engr. CD 6/23—ENR 6/29.

FABRICATION for WATERWAYS

River, Highway and Rail Shipments. Welded steel fabrication for ships—barges—locks—dams and kindred waterway uses. 5 Acres of plant and facilities.

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Offices — Wheeling, W. Va.
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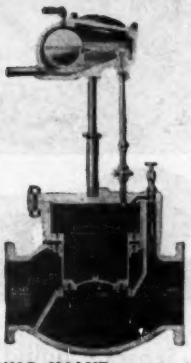
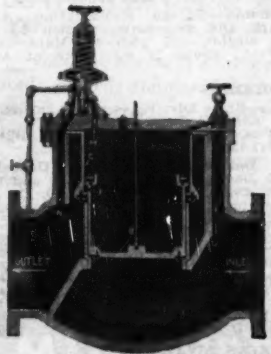
CONTROLLED FLOAT VALVE

Ideally suited for operations on closed or open tanks, reservoirs, basins, etc. Maintains water levels within 1" variation. Furnished without self-contained float ball chamber if desired. Units are available in 3" to 36" sizes.





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. . . gives constant terminal-delivery pressure under varying demands. No metal contacts, shock or jar upon adjustment. Valves are furnished in sizes from ½" to 36".

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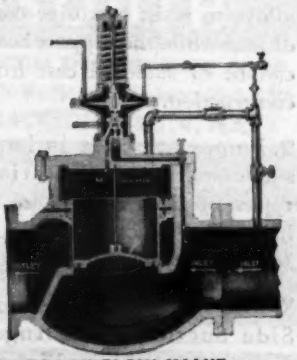

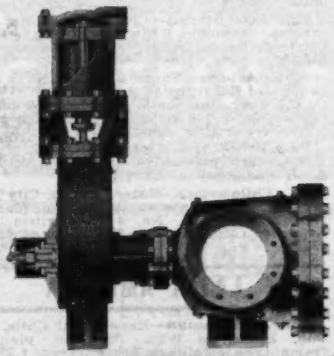

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Designed for use on any automatic operating service (altitude, reducing, check, relief, etc.). This unit can be supplied in manually operated designs in lieu of gate valves. Cone valves are supplied in 4" to 72" sizes.

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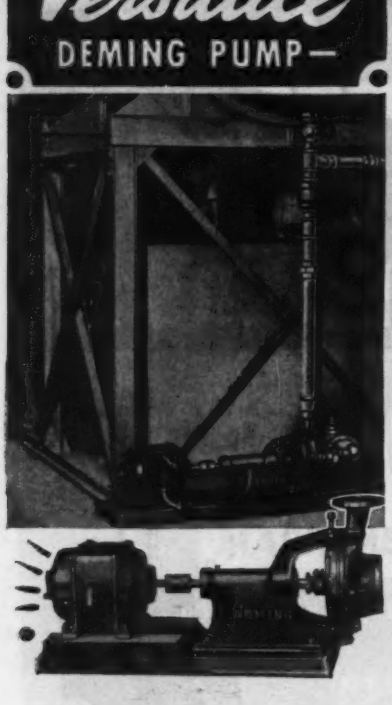

1. Separate liquid end construction. This makes for economy to the user as only the liquid end of the pump need be furnished with special alloys to resist corrosive conditions while the support head can be of standard cast iron construction.

2. Pumps are built in both single and two ball bearing types in sizes from 1 to 10 inches and for capacities from 10 to 3600 gallons per minute.

When you specify Deming Side Suction Centrifugal Pumps you obtain highest standards of pump performance at lower costs.

THE DEMING COMPANY
SALEM, OHIO

SPECIFY DEMING PUMPS

EARTHWORK, WATERWAYS, etc. (Proposed Work, Cont'd.)

Tex., Waco—McLennan Co., Waco, cleaning, reshaping Marlin Creek. Over $15,000. M. Hannah, Court House, Co. engr.

BIDS ASKED

Bids Asked July 25

Ia., Muscatine—Muscatine Levee Imprvt. Comn., City Hall, raising levee along Mississippi River from point about 1,000 ft. north of McKee Button Plant southward to city limits. Plans deposit $15. Stanley Eng. Co., Muscatine, engrs.

Bids Asked July 27

†**Colorado**—Bureau Reclamation, Court House, Denver, two 12 ft. x 12 ft. radial gates with rollers, pin bearings, wall plates, gate sills and accessories and two 6,000 lb. motor-operated radial gate hoists, complete with accessories for installation at inlet to Shadow Mountain Lake, Granby pump canal, Colorado-Big Thompson Proj., Spec. 1747-D. Extended date. CD 7/5.

Bids Asked July 28

†**Idaho**—Bureau Reclamation, Court House, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Mountain Home, 1 lot trashracks consisting 56 racks to be installed in inlet structure of outlet works at Anderson Ranch Dam, Boise Proj., Spec. 1743-D.

Bids Asked August 2

†**Oregon**—Bureau Reclamation, Denver, Colo., furnishing, del. in stock piles, approx. 10,200 tons sand and 16,900 ft. tons course aggregate for North Main canal on Deschutes project, Spec. 1749-D. S. O. Harper, ch. engr.

Bids Asked August 4

†**Arizona and Nevada**—Bureau Reclamation, Denver, Colo., furnishing, del. fabricated structural steel for 161-kv. switchyard, Parker power plant and 161-kv. installation, Phoenix substation, Davis Dam Project, Spec. 1751-D. Plans deposit $1.25.

†**Oklahoma**—Bureau Reclamation, Altus, earthwork and structures, station 85 plus 73.5 to station 125 plus 60 Main canal, Altus Proj., about 16 mi. north of Altus, Spec. 1078.

LOW BIDDERS

Illinois—State Div. Waterways, Springfield, July 6, channel imprva., Union Co., from Joyce Bros. Contg. Co., Myers Bldg., Springfield. $47,430. CD 6/27—ENR 6/29.

†**Md., Bainbridge (sta. Port Deposit)**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., July 3, river intake, Naval Training Station, NOY 9212, from Tuller Constr. Co., P. O. Box 431, Red Bank, N. J., $104,800. CD 6/27—ENR 7/6.

Massachusetts—Commonwealth of Massachusetts, 20 Somerset St., Boston, June 29, repairing seawall, etc., Lynn Shore Reservation, from Red Rock to Humphrey St., from A. D. Daddario, 52 Chauncy St., Boston, $24,550. CD 6/20—ENR 6/22.

CONTRACTS AWARDED

†**Calif., Needles**—Bureau Reclamation, Boulder City, Nev., exten. Colorado River levee, own forces. $350,000.

Ill., Bloomington—City and State Div. Waterways, 201 W. Monroe St., Springfield, reconstructing portions of spillway; Lake Bloomington, to Whetzel Brothers, 201 North Walnut St., Champaign, $54,416. Bids 6/1, awarded 6/26. CD 6/6—ENR 6/8, under LB.

La., New Orleans—City Purch. Agt., subsurface drainage Hedwidge Lane, etc., to Clement Betpouey, Jr. & Co., Cypress St., $15,826. Bids 6/20.

†**Ore., Astoria**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., dust and erosion control, Naval Air Station, NOY 10077, to Foster & Kleiser Co., 5 Ave. N. at Roy, Seattle, 9, Wash., $22,343.

Pa., Erie—State Dpt. Forests & Waters, Harrisburg, permeable concrete jetty, to A. J. Fasenmeyer, Erie, $24,666.

Pa., Phila.—City, Water Bureau, City Hall, dredging Torresdale water filtration plant, to Eastern Eng. Co., No. 4 N. Carlisle Ave., Atlantic City, N. J., $215,000. Awarded 6/30.

LATIN AMERICA

Chile, Caracautan—Republic of Chile, Dpt. Pub. Bldgs. & Wks., Santiago, plans 50 frame type dwellings for workers. 1,250,000 pesos.

Chile, Santiago—Republic of Chile, Dpt. P. Bldgs. & Wks., Santiago, plans 287 dwellings and commercial bldgs., on Pedro Aguirre Hy. between Santiago proper and its airport. 5,500,000 pesos.

Chile, Vina Del Mar—City plans 1,000 low cost dwellings. 2,000,000 pesos.

★**Mexico**—National Railways of Mexico, L. Reina, ch. engr. M. W. 19 Bolivar St., Mexico City, bids last half of 1944 reconstruction Mexico railways, laying rails, new roundhouses, etc., most rehabilitation will be in San Luis Potosi state. $3,500,000.

Mexico—Dpt. Communications & P. W. M. Camacho, dir., Presidential Palace, Mexico City, will construct and repair Acapulco-Ometepec-Oaxaca Hy., about 300 mi., own forces. $500,000.

Mexico—Federal Health Bd., Dr. Gustavo Baz, secy., Presidential Palace, Mexico City, bids in 90 days, constructing sanitoriums in states of San Luis Potosi and Tlaxcala. $609,000.

Mexico—State of Jalisco, Gov. Marcelino Garcia Barragan, Guadalajara, bids last half 1944, constructing sewerage, WW, bridges, roads and irrigation, $450,000.

Mexico, Ciudad Guztanan—State of Jalisco, Gov. Marceline Carcia Barragan, Gubernatorial Palace, Guadalajara, will construct dam at Ciudad Custenan for irrigation of nearby cities, by own forces. $110,000.

Mexico, Mexico City—Imperial Diesel Engineering Co., bids soon constructing, equip diesel motor mfg. plant, $1,500,000. CD 4/3—ENR 4/6.

Mexico, Orizaba—City, Municipal Bds. will construct road repairs, incl. 3 principal blvds. of city, by own forces. $100,000.

Mexico, Saltillo—State of Coahuila, Capital City, Torreon, bids within 90 days, group agricultural schools. $150,000.

Mexico, Tampico—City of Tampico, Fernandez Y Grajales, zone dir., Municipal bldg., bids last half 1944, city hospital, $100,000.

Mexico, Tecomaxtlahuaca—City, F. Salazar, pres., bids within 90 days, construct water sys. for city and surrounding town, $100,000. Approved by Dr. Gutavo Baz, sec. Federal Health Bureau, which will help finance.

PUBLIC BUILDINGS

PROPOSED WORK

†**Calif., Los Angeles**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 5 portable shelter units, Calif. 4875; 500 portable shelter units, Calif. 4876; 500 portable shelter units, Calif. 4877; 500 portable shelter units, Calif. 4878.

†**Calif., Mojave**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 10 family stop-gap housing units, Calif. 4880.

†**Calif., Oakland**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., architectural and engineering services by Clark & Lloyd, 210 Post St., San Francisco, for Wave quarters.

Calif., Ontario—City, library. $150,000.

†**Calif., San Clemente Island**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 8 family dwelling units, Calif. 4873.

†**Calif., San Francisco**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, plans by Starks & Sharps, Field Bldg., and W. G. Merchant, 57 Post St., 500 portable shelter units, Calif. 4866.

†**Calif., San Francisco**—Home Owners Loan Corp., 321 Market St., plans by L. S. Mosias, 255 California St., converting gymnasium bldg., at 2350 Geary St., providing 44 living units, for in-migrant war workers, Calif. No. W4A-34. Over $75,000.

★†**Calif., San Francisco**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 260 family dwelling units. $750,000.

†**Calif., Sawtelle (Sta. Los Angeles)**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., 25, D. C., 3 story, reinf. con. administration and clinical bldg. Over $150,000.

Colo., Pueblo—Colorado State Hospital, Pueblo, plans completed by Architectural Associates, 736 Thatcher Bldg., hospital, $200,000. CD 4/5—ENR 4/13.

†**Fla., Pensacola**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 50 family stop-gap dwelling units, Fla. 8251.

†**Ill., Chicago**—Little Co. of Marys Hospital, 95 St. and California Ave., plans by McCarthy & Smith, 43 E. Ohio St., 2 story, brick, rein.-con. cadet nurses home. $200,000. FWA.

Ind., Gary—Mrs. Frankie Helman, trustee, Calumet Twp., 107-09 Lake Superior Court Bldg., 15 W. 4 Ave., sketches by J. H. Wildermuth, 537 Bway., 1 story, bsmnt., brick, rein.-con. township school near here, $150,000.

Ind., Indianapolis—R. Smith, Trustee, Washington Twp., 6001 Carrolltown Ave., sketches by McGuire & Shook, 1400-01 Fletcher Trust Bldg., 1 story, bsmnt., brick, stone, rein.-con., steel school. $242,000.

★**Ind., Kokomo**—Bd. School Trustees, C. V. Haworth, supt. Schools, sketches by McGuire & Shook, 1400-01 Fletcher Trust Bldg., Indianapolis, brick, stone, steel, rein-con. field house and recreation bldg. $650,000.

†**Ia., Quenton**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, 6, Ill., 50 unit family stop-gap housing, Ia. 12053.

La., New Orleans—New Orleans Hospital & Dispensary for Women and Children, 60 Jax Ave., plans by Wm. R. Burk Associates, Architects & Engineers, Pan American Bldg., 3 story, 90x160 ft., masonry hospital bldg. and dispensary. $150,000.

ERLIC BLDGS. (Proposed Work, Cont'd.)

Mass., Springfield—Pub. Housing Auth., HA, 24 School St., Boston, revised plans ing completion addnl. grading, etc., for erview War Housing, Mass. 19026. CD 4—ENR 5/25.

Neb., Hastings—Pub. Housing Auth., H. Dierks Bldg., 1006 Grand Ave., Kan- City, Mo., 200 stop-gap family dwelling ts, Neb. 23083. CD 5/21—ENR 5/23.

N. Y., Pawling—U. S. Eng., 120 Wall St., w York, Zone 5, bids soon, housing facili- s. $45,700.

O., Toledo—Pub. Housing Auth., NHA, 0. E. 9 St., Cleveland, plans by Britsch Munger, Nicholas Bldg., 150 family stop- dwelling units, Ohio 33296.

Ore., Astoria—Pub. Housing Auth., NHA, nner Bldg., 5 Ave. Union St., Seattle, 1, sh., 10 Family dwelling units, Ore. 35248.

Tenn., Memphis—Southern Acid & Sul- r Co., c/o T. J. Twomey, plant mgr., rford Ave., chemical plant expan. 0,000. Defense Plant Corp. will finance.

Tex., Dallas and Grand Prairie—Pub. using Auth., NHA, 1206 Electric Bldg., enth and Taylor Sts., Fort Worth, re- ted bids May 3, housing site imprvs., road halt topping, parking areas, grading, ining, culverts, etc., Tex. 41605, 41611, HA 41617 and 41609. CD 5/9—ENR 5/11, der LB.

Tex., Galena Park—Galena Park Ind. ol Dist., school bldg. $225,000 bonds ted.

Tex., Galveston—State Health Dpt., c/o Geo. Cox, Land Office Bldg., Austin, s by R. R. Rapp, Guaranty Bldg., hos- al bldg., Tex. 41-691. $89,805. Applied FWA funds. CD 4/3/43—ENR 4/29/43.

Tex., Laredo—Pub. Housing Auth., NHA, 6 Electric Bldg., Seventh and Taylor , Forth Worth, rejected bids June 7, re- structing outside electric street lighting housing. $35,000. Consolidated Archi- ts & Engineers, Capps Bldg., Fort Worth, hts.

Va., Denbigh—Pub. Bldgs. Admin., 18 and Sts. N.W., Wash., 25, D. C., 1 story school g., County Line Rd. near 48 St., Va. 310-P. near here. $137,100. FWA. No opening scheduled. Williams, Colle & ms, 401 Melson Bldg., Newport News, hts. CD 6/13—ENR 6/15, under BA.

Wash., Seattle—School Dist. 1, bids soon nursery schools. $158,800. FWA. Nara- re & Brady, Dexter Horton Bldg., archts. 4/18—ENR 4/20.

Alta., Bisirmore—Municipality, 100 bed pital. $300,000.

Alta., Wetaskiwin—Provincial Govt., c/o istry of Agriculture, Edmonton, plans by . P. Wks., Edmonton, agricultural school. ,800.

B. C., Kamloops—Royal Inland Hospital, mloops, plans by Townley & Matheson, 5 Hornby St., Vancouver, new hospital g, also altering hospital. $350,000. By r to be submitted to ratepayers in Sep- ber.

B. C., Vancouver—Dominion Govt., Ot- a, Ont., plans by D. C. Sutherland, Dpt. Wks., Ottawa, Ont., 4 story, rein.-con. pital addn., Laurel Ave. $455,000.

Ont., Kingston—Wartime Housing, Ltd., York St., Toronto, converting women's time residence into military hospital, een St., for Dpt. Natl. Defense (Army), wa, Ont. About $250,000.

Ont., London—Wartime Housing Ltd., 55 St., Toronto, 75 houses. $225,000.

Ont., Windsor—City, C. V. Waters, secy., Hall, 50 semi-detached dwellings. ,000.

Que., Hull—Catholic School Comn., City plans by L. Sarra-Bournet, 139 Princi- St., imprv. schools. $150,000.

Que., Beauceville—Province of Quebec, c/o istry of Municipal Affairs, Quebec City, erculosis sanatorium. $300,000. Dpt. P. , Quebec City, archts.

Que., Gaspe—Provincial Govt., c/o Min- ry of the Attorney General, Quebec City, s by W. Lacroix, 132 St. Peter St., Que- City, court house and jail. $150,000. P. Wks., Quebec City, engrs. CD 4/27 NR 5/4.

Que., Hull—Wartime Housing, Ltd., 55 York St., Toronto, Ont., 200 addnl houses. ,000.

Sask., Moose Jaw—Moose Jaw Housing , c/o W. R. Thatcher, alderman, City dwellings, average cost $4,500 each. l est. $150,000.

BIDS ASKED

Bids Asked after July 12

Me., Portland—Federal Works Agency, Chauncy St., Boston, Mass., 2 room, brick ol, Long Island, Me. 17-160. $16,000. er & Beal, Inc., 465 Congress St., archt.

Pa., Farrell—Mercer Co. Housing Auth., Peoples Bank Bldg., 150 permanent fam- dwelling units, Pa. 201. $700,000. Burke, rt & Braziell, Magee Bldg., Pittsburgh, a. CD 6/26—ENR 6/29.

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked July 17

†**N. Y., Syracuse**—Syracuse Universit altering nurses school and dormitory, N. 30284. $99,000. **FWA.** T. Pederson, Syr cuse Kemper Bldg., archt. CD 6/7—E 6/15.

Bids Asked July 18

★†**Md., Perry Point**—Veterans Admin Vermont Ave. between H and I Sts. N.W. Wash., 25, D. C., 2 story, rein.-con. hospit bldg. $900,000. Extended date. CD 3/23 ENR 4/6.

†**Virginia**—Pub. Bldgs. Admin., 18 and Sts. N.W., Wash., 25, D. C., 1 story, classroom school bldg. on County Line R near 48 St., Warwick Co. **FWA.**

†**Va., Alexandria**—Pub. Housing Auth NHA, Temporary Bldg., 2, 19 and D Sts Wash., 25, D. C., 166 family dwelling uni Va. 4-3. J. Saunders, 915 King St., archt CD 3/30—ENR 4/6.

Bids Asked July 20

★†**N. J., Newark**—Pub. Housing Auth NHA, 270 Bway., New York, 7 N. Y., family dwelling units, N. J. 2-9. $400,00 Plans deposit $50. W. E. Lehman, 972 Broa St., archt. CD 6/7—ENR 6/15.

†**N. Y., Sidney**—Pub. Housing Auth., NH 270 Bway., New York, Zone 7, alteration painting at Sherwood Heights Housing, N. 30051.

†**Va., Norfolk**—Yards & Docks, Navy Dep 18 St. and Constitution Ave. N.W., Wash 25, D. C., addnl. storage bldg. for ordnan material, at N.O.B., NOY 9046.

Bids Asked July 21

†**Va., Quantico**—Yards & Docks, Navy Dep 18 St. and Constitution Ave. N.W., Wash 25, D. C., boiler and refrigerator plant exte and distr. sys., Marine Barracks, NOY 91

Bids Asked July 22

†**Minn., St. Cloud**—Sisters of the Order St. Benedict, Sister Ethelburg Serrel, sec St. Benedict, 2 story, 40x150 ft., rein.-co brick, nurses home at St. Cloud Hospit $150,000. **FWA.** Plans deposit $10. Le & Thorshov, 1200 2nd Ave. S., Minneapol archts. R. D. Thomas & Associates, 12 2nd Ave., Minneapolis, engrs.

Bids Asked July 25

†**Ill., Downey**—Veterans Admin., Verm Ave. between H and I Sts. N.W., Wash. D. C., Boiler House Bldg. 33 addn., Fr 2261. CD 6/7—ENR 6/29.

B. C., Essondale—Minister P. Wks., V toria, occupational bldg. exten., for Provin of British Columbia, Victoria. Plans d posit $10. Dpt. P. Wks., Victoria, archt

Bids Asked July 26

★**Ont., Toronto**—Secretary Dpt. P. Wk Ottawa, hospital development for U Patients Neuro-Psychiatric Bldg. and boil house, etc., Sunnybrook Park near ha $1,500,000. Plans deposit $200. C. Sutherland, archt., c/o owner. Allward Guiniock, 67 Bloor, Toronto, Assoc. archts.

Bids Asked About July 27

†**Mich., Wayne** — Pub. Bldgs. Admin., and F Sts. N.W., Wash., 25, D. C., Jacks School, Mich. 20-336. O'Dell, Hewlett Luckenbach, 2317 Dime Bldg., Detro archts. **FWA.** CD 6/30—ENR 7/6.

†**Okla., Midwest City**—Pub. Bldgs. Admi 18 and F Sts. N.W., Wash., 25, D.C., 1 sto part bsmnt. school and recreation bld Okla. 34-173-A. $150,000. **FWA.** Hudg Ball & Associates, 919 Cotton Exchan Bldg., Oklahoma City, archts. CD 6/1 ENR 7/6.

Bids Asked August 8

†**Tex., Waco**—Veterans Admin., Verm Ave. between H and I Sts. N.W., Wash. D. C., treatment bldg., storehouse add laundry, etc. CD 1/28—ENR 2/3.

LOW BIDDERS

†**D. C., Bellevue**—Yards & Docks, Na Dpt., 18 St. and Constitution Ave. N.W Wash., 25, D. C., June 30, expansion ba racks at Radio Material School, NOY 9 from F. H. Martell Co., 920 17 St. N.W Wash., $167,790. CD 6/6—ENR 6/8.

†**Ga., Augusta**—U. S. Eng., Post Of Bldg., Savannah, heating plant addn., fr Tri-State Constr. Co., 114 Ellis Ave. N.W Atlanta, $84,439.

★†**Mich., Detroit**—Pub. Housing Aut NHA, 2072 E. 9 St., Cleveland, O., July 399 temporary family dwelling units, Mic 20233, from W. E. Wood Co., 4649 Humbol St., $1,540,000. CD 6/7—ENR 6/15.

†**Mich., Detroit**—Pub. Housing Aut NHA, 2072 E. 9 St., Cleveland, O., 136 tem porary dwelling units, Mich 20231, fro John A. Johnson, 268 41 St., Brooklyn, N. $372,000. CD 5/26—ENR 6/1.

†**Tex., Berger**—Bd. Educ., L. J. Robe pres., June 29, school bldg. addns., Tex. 674-N, from Manhattan Constr. Co., Manha tan Bldg., Muskogee, Okla., $223,509. FW CD 6/15—ENR 6/22.

†**Tex., Orange**—Pub. Housing Auth., NH 1305 Electric Bldg., Seventh and Tay Sts., Fort Worth, street imprvs., Tex. 41 and 41173, from R. P. Farnsworth & C Inc., 1515 S. Salcedo St., New Orleans, L $100,373.

PUBLIC BLDGS. (Low Bidders, Cont'd.)

†Tex., Texarkana—U. S. Eng., 221 W. Main St., Denison, warehouse, from Robert E. McKee, First National Bank Bldg., Dallas, $110,000. CD 6/2—ENR 6/8.

†Va., Falls Church—City, W. T. Woodson, Schools, July 6, high school, Va. 44-100-N, from C. E. Nuckels, 1103 East Main St., Richmond, $225,700. FWA. CD 6/29.

Va., Petersburg—State, Richmond, June 28, remodeling Central State Hospital for Negroes, from J. Kennan Perrin Co., Central National Bank Bldg., Richmond, $104,-704. Baskerville & Son, Central National Bank Bldg., Richmond, archts.

†W. Va., South Charleston—Town, June 16, 2 story, bsmt., brick, rein.-con. hospital, W. Va. 46-120, from Moyer Bros., Altoona, Pa., $101,200. FWA. CD 6/9—ENR 6/15.

CONTRACTS AWARDED

†Calif., Maywood—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, addnl. warehouse storage space, Maywood Supply Depot, Job No. 665, to Zoss Constr. Co., 1037 North Cole Ave., Los Angeles, $569,-265. CD 6/15—ENR 6/22.

†Calif., Oakland—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl bldgs. Naval Hospital, NOY 9777, to McDonald & Kahn, Inc., Financial Center Bldg., San Francisco, $608,-700. CD 7/3, under LB.

†Calif., Redwood City—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., drum storage facilities, Naval Fuel Depot, NOY 8753, to Barrett & Hilp, 918 Harrison St., San Francisco, $287,114.

†Calif., San Francisco—U. S. Eng., 74 New Montgomery St., emergency power plant at Presidio, to H. H. Larsen, 64 S. Park St., $42,925.

†Calif., Seal Beach—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., ammunition overhaul facilities, Naval Ammunition Depot, NOY 7953, to Wm. P. Neil Co., Ltd., 4814 Loma Vista Ave., Los Angeles, $1,229,424. CD 7/3, under LB.

†Conn., Fairfield—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., grading, drainage and water pipe house service for housing, Conn. 6071 and 6072, to Pascone Brothers, Inc., 73 Steuben St., Bridgeport, $81,148. Bids 7/5. CD 6/27—ENR 6/29.

†Del., New Castle—U. S. Eng., 6 and Walnut Sts., Phila., Pa., bldgs., to Irwin & Leighton, 1505 Race St., Phila., Pa., $243,-000. Awarded 6/30.

†D. C., Bellevue—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., aircraft electric bldg., Naval Research Laboratory, NOY 8903, to Wm. P. Lipscomb, Woodward Bldg., Wash., D. C., $577,000. Bids 6/23, awarded 7/5. CD 6/26—ENR 6/29, under LB.

†Ind., Crane—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., med. caliber projectile loading plant, Naval Ammunition Depot, NOY 8823, to Pearson Constr. Co., 917 Kentucky Home Life Bldg., Louisville, Ky., $335,671.

†La., New Orleans—Pub. Housing Auth., NHA, 1295 Electric Bldg., Seventh and Taylor Sts., Fort Worth, Tex., clearing, grubbing, drainage canal for housing, La. 16106, to R. P. Farnsworth & Co., Inc., 1515 S. Salcedo St., $47,344. CD 6/12—ENR 6/15, under LB.

†Me., Portland—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., grading, drainage, for housing Me. 17031, to G. Wyner, 22 Pierce St., Malden, Mass., $54,600. Bids 6/30. J. Howard Stevens, 137 Middle St., archt.

†Md., Annapolis—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., constructing 100 Homoja huts at U. S. Naval Academy, NOY 9719, to Potts & Callahan Contg. Co., Inc., 821 15 St. N.W., Wash., D. C., $508,900. Bids 6/28. CD 6/29, under LB.

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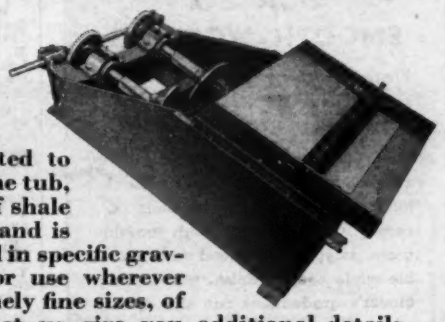

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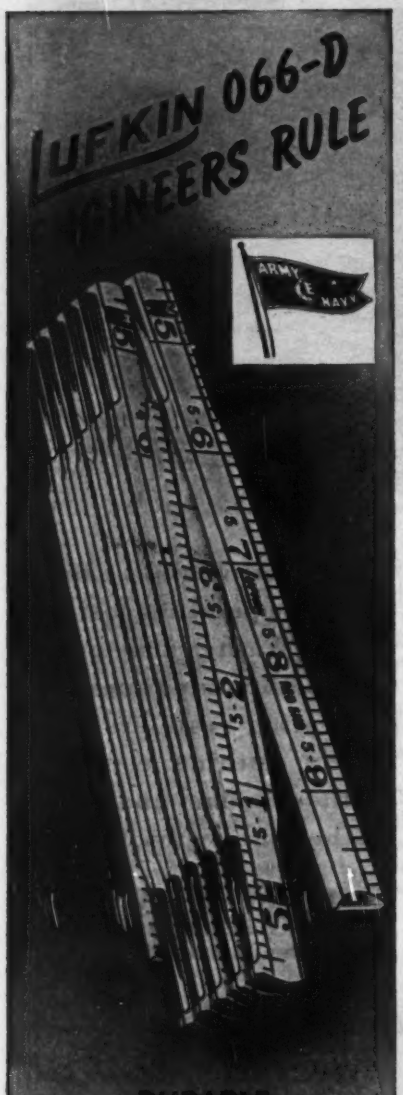

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PUBLIC BLDGS. (Contracts Awarded, Con.)

★†**Md., Indian Head**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash. 25, D. C., permanent chemical laboratory, Naval Powder Factory, NOY 9363, to James Stewart & Co., Inc., Washington Bldg., Wash., D. C., **$539,500.** CD 6/22—ENR 6/29, under LB.

†**O., Mecca Twp.**—Bd. Educ. Mecca Twp. Rural School Dist., 2 story, bsmnt., 101x156 ft., brick school, Ohio 33-280-N, to Felix Pesa & Sons Co., 745 Andrews Ave., Youngstown, **$160,000.** FWA. Keich & O'Brien, Warren, archts. CD 4/10—ENR 4/13.

O., Wauseon—Wauseon Bd. Educ., O. L. Watkins, clk., school bldg. replacement, to Steinle-Wolfe, Inc., 1515 Croghan St., Fremont, **$212,842.** CD 6/8—ENR 6/15.

★†**Pa., Coatesville**—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash., 25, D. C., infirmary bldgs., etc., to Jos. Weinstein, Inc., 66 Court St., Brooklyn, N. Y., **$993,333.** Bids 6/27. CD 6/29—ENR 7/6, under LB.

S. C., Edgefield—City and REA Corp., Edgefield, abattoir and freezer locker plant, to W. S. Reamer, Seaboard Park, Columbia, **$40,000.** Pickell & Pickell, Prevost Bldg., Greenville, archts.

†**Tex., Corpus Christi**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl. barracks, N.A.T.T.C., Ward Island, NOY 9611, to Lawless & Alford, P. O. Box 752, Longview, **$364,364.**

†**Tex., Daingerfield**—Lone Star Steel Co., Southland Life Bldg., Dallas, and Daingerfield, addnl. steel plant facilities, own forces, **$400,000.** Defense Plant Corp. will finance. CD 5/1—ENR 5/4.

†**Tex., Etter**—U. S. Eng., 331 W. Main St., Denison, ordnance auxiliary bldg., for Ordnance Plant, near Amarillo and Dumas, to Robb-Musick Co., Amarillo, **$55,611.**

†**Tex., Fort Sam Houston**—U. S. Eng., Fort Sam Houston, cold storage plant, incl. bldg., railroad spur, parking areas, Spec. 1126, to L. Christy, American Hospital & Life Bldg., San Antonio, **$92,734.** Bids 6/29. CD 6/9—ENR 6/15.

†**Tex., Harlingen**—Pub. Housing Auth., NHA, 1205 Electric Bldg., Seventh and Taylor Sts., Fort Worth, 200 family dwelling units, Tex. 41-653, to H. H. Moeller, San Antonio, 1211 Willow St., **$450,466.** CD 6/29, under LB.

†**Utah, Clearfield**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl. fire station, Naval Supply Depot, NOY 9023, to Perkins Contr. Co., 626 Dooly Bldg., Salt Lake City, **$176,206.**

†**Vt., Springfield**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., community bldg. addn., road and drainage work, grading, Vt. 43011 and Vt. 43014, to Tebaldi Supply Co., Inc., 479 Main St., Indian Orchard, Mass., **$33,000.** Bids 6/30. CD 6/26.

†**Wis., Merrimac**—U. S. Eng., 408 Federal Bldg., Milwaukee, 21 rest houses at Badger Ordnance Works, to Willner-Sauers, 1542 W. Larpenteur Ave., St. Paul, Minn., **$61,092.** Bids 6/19. Mason & Hanger Co., 500 5 Ave., New York, N. Y., engrs. and archts.

Wis., Richland Center—Richland Co., general contract 1 and 2 story, 82x126 ft. and 72x94 ft. county highway shop, to Viggo M. Jensen & Co., 1031 Virginia Pl., Albert Lea, Minn., **$36,944.** Bids 6/27. Will readvertise for heating, ventilating, crane and overhead door. CD 6/20—ENR 6/22.

Ont., Brantford—Wartime Housing Ltd., 55 York St., Toronto, 100 houses, cement block or solid concrete fdn., to Johnson Bros. Co., Ltd., 37 Market St., about **$300,000.**

Ont., Oshawa—Wartime Housing Ltd., 55 York St., Toronto, 100 houses, to John Maguire Contg. Co., Ltd., 24 Birch Ave., Toronto, about **$450,000.** CD 6/1—ENR 6/8.

★**Ont., Toronto**—Wartime Housing Ltd., 55 York St., 200 addnl. houses, to W. H. Yates Constr. Co., Ltd., 400 Wellington St. N., Hamilton, about **$600,000.** CD 5/17—ENR 5/25.

★**Ont., Windsor**—Wartime Housing Ltd., 55 York St., Toronto, 250 dwellings, to Ryan Contg. Co., Ltd., 210 Detroit St., about **$375,000.** CD 5/10—ENR 5/25.

Que., Montreal—Congregation of Reverend Sisters of Mercy, 1051 St. Hubert St., 5 story, 100x1,700 ft. rein.-con., brick, stone hospital addn., to Dansereau Ltd., 1337 W. Bernard St. Est. over **$1,000,000.** G. Gagnier, 308 E. Ste. Catherine St., archt.

Que., Montreal—Dpt. P. Wks., Quebec City, converting University of Montreal bldgs. into Provincial Govt. office bldg., St. Denis St., to J. H. Dupuis, Ltd., 630 St. Catherine St. E., **$400,000.** E. Gohier, c/o owner, engr.

Que., Verdun—Verdun General Hospital, Rev. Sister Angeline, superior, new wing, to Concrete Constr. Ltd., 1062 Decarie Blvd., Montreal, approx. **$300,000.** S. Braia, 7084 St. Denis St., Montreal, archt.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Pasadena—California Institute of Technology, 1201 E. California St., 3 story, bsmnt., sub-bsmnt., rein.-con. mechanical engineering bldg. Over $150,000.

Ind., Indianapolis — Butler University, J. W. Atherton, bus mgr., Butler Campus, sketches by D. A. Bohlen & Son, 1001 Farm Bureau Bldg., 1 story, 72x180 ft. granite limestone, concrete memorial chapel, $300,000.

Pa., Greenville — Martsolf & Martsolf, archts., soon let contract 512 3 Ave., New Brighton, altering 3 story, bsmnt. dormitory for Bd. Trustees Thiel College, A. Zimmerman, pres., College Ave. $150,000.

Pa., Midland—W. Stuart Thompson, archt., 125 E. 46 St., New York, N. Y., soon let contract, converting 3 story, bsmnt., 90x120 ft. frame, brick apartment into office bldg., Midland Ave., for Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y. $100,000.

B. C., Burnaby—International Artists' Films Corp., Ltd., c/o H. Cullerne, Pacific Coast Fire Bldg., Vancouver, plans by H. Cullerne, Pacific Coast Fire Bldg., Vancouver, modern movie studios, offices and administration bldgs. $250,000.

N. B., Edmundston—Reverend Sisters of St. Joseph, St. Basile, plans by Beaule & Morissette, 21 d'Anguillon St., Quebec City, Que., 5 story, bsmnt., concrete hospital, $400,000.

Ont., Kapuskasing—Kimberly Clark Corp. of Canada, Ltd., 330 University Ave., Toronto, and Spruce Falls Pulp & Paper Co., Ltd., Kapuskasing, apartment bldg. $185,000.

★**Ont., Toronto**—Wellesley Hospital, Homewood Pl., 3 story hospital addn. $900,000.

BIDS ASKED

Bids Asked Late in July

Ark., Hot Springs—Malco Theatre Co., Inc., 817-823 Central Ave., theatre. $250,000. Brueggeman, Swaim & Allen, Gazette Bldg., Little Rock, archts. CD 6/28—ENR 7/6.

CONTRACTS AWARDED

★**Calif., Burbank**—Chapman Square, 4141 Lankershim Blvd., North Hollywood, one hundred thirty-four 3 bedroom, thirty-five 2 bedroom and 12 double frame, stucco dwellings, to Jane Reed Kissinger, 4141 Lankershim Blvd., North Hollywood, approx. **$750,000.**

Calif., Long Beach—Cabart Theatres, Inc., 1350 seating capacity rein.-con. theatre, 20 St. and Santa Fe Ave., to Chas. W. Pettifer, 703 W. 14 St., over **$150,000.** Jess J. Jones, Farmers & Merchants Bank Bldg., archt. Davies & Stafford, Ocean Center Bldg., engrs.

★**Calif., Mayfair**—Hathaway Homes, Inc., Lakewood Blvd., at South St., Zone 4, 196 frame, stucco dwellings, to J. M. Walker Constr. Co., Lakewood Blvd. and South St., Zone 4, approx. **$1,000,000.**

Calif., Newhall — Bermite Powder Co., Sierra Hy., 48 frame, stucco dwellings. Owner builds. **$160,000.**

★**Calif., Redondo Beach** — Eric Flodine, 2021 Wellington Rd., Los Angeles, 186 defense dwellings, Tract 11237. Owner builds. **$850,000.**

Calif., Torrance—Harlan Cross, Inc., 2501 Strand St., Manhattan Beach, 45 frame, stucco dwellings. Owner builds. **$150,000.**

Calif., Venice—Nate Bershon, P. O. Box 67, Mar Vista, 88 frame, stucco dwellings, to Bershon Realty Co., P. O. Box 67, Mar Vista, approx. **$335,000.**

Conn., Naugatuck—Naugatuck Development Co., Quinn and Chestnut Sts., 50 frame houses, Chestnut St. Owner builds. **$250,000.**

Ill., Chicago—Syndicate represented by Margaret Code, c/o David Saul Klafter, archt., 100 N. La Salle St., modernizing 6 story, 80x140 ft. office and store bldg., State and Lake Sts., separate contracts. **$130,000.** CD 6/7—ENR 6/15.

Tex., Galena Park—Earl Middleton, Galena Park, 100x296 ft., hollow tile, stucco, etc., store bldg., to T. D. Howe, 3219 White Oak Dr., Houston, **$142,870.** Hedrick & Lindsley, 811 So. Standard Bldg., Houston, archts.

Tex., Harlingen—Port Industries Corp., Harlingen, 76 unit housing. Owner builds. Approx. **$190,000.** FHA.

Ont., Sudbury—Sudbury Separate School Bd., H. Regimbal, secy., 234 King St., 2 new schools and addn., to F. Levesque, 276 Cedar St., **$155,111.** P. J. O'Gorman, Mackay Bldg., archt.

★**Ont., Windsor**—Sterling Constr. Co., 2494 Sandwich St. E., 500 permanent type dwellings, own forces. Est. **$2,750,000.**

Que., Montreal—Cadillac Investments, Inc., 31 W. St. James St., brick apartment block, concrete fdn., Viau St., Maisoneuve Ward, own forces under supervision J. H. Lavoie, 3920 Lejeunesse St. Est. **$150,000.** C. Grenier, 4050 Kent St., archt. Archambault & Roy, 6278 1 Ave., engrs.

OMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

Que., Sally—Notre Dame Orphange Bd., ...ally, orphanage, to J. A. Lambert, 7 Main ...Ste. Anne de La Pocatiere. Est. $150,000. CD 5/10.

INDUSTRIAL BUILDINGS

ROPOSED WORK

Ark., Judsonia—PLANT—C. A. Figley, ...udsonia, rebuilding plant of Enterprise Box ...o., destroyed by fire. $40,000 or more.

Calif., Torrance — PLANT — General Petroleum Corp., 108 W. 2 St., Los Angeles, ...0-octane gasoline plant expansion. ...,591,910.

Calif., Wilmington—PLANT—Union Oil Co., Union Oil Bldg., Los Angeles, 100-octane gasoline plant. $1,569,700.

Minn., Collegeville—POWER PLANT—St. ...hn's University, Rev. G. Winkelman, ...chitectural Dpt., imprv. power plant. ...0,000 (not official). Toltz, King & Day, ...10 Pioneer Bldg., St. Paul, engrs.

Miss., Grenada — LAUNDRY — Peerless ...aundry, c/o E. E. Foster, Grenada, laun-...ry, $40,000.

N. Y., New York—FREIGHT HOUSE—Erie ...R., J. W. Smith, ch. engr., Midland Bldg., Cleveland, O., soon lets contract freight ...ouse, W. 29 St.

O., Cleveland—FOUNDRY, etc.—Republic ...rass Co., R. A. Blywise, pres.-treas., 1623 ...E. 45 St., Cleveland, plans by Christian, ...chwarzenberg & Gaeda Co., 1836 Euclid ...ve., 1 story, 19x36 ft., brick, steel foundry ...ddn., and 43x73 and 13x29 ft. brick, steel ...eller room addn. $40,000.

O., Mansfield—FACTORY—Mansfield Tire ...Rubber Co., Mansfield, soon lets contract, ...story, 35x60 ft., rein.-con., brick factory ...ddn. Chas. W. Conklin, Farmers Bank ...Bldg., archt.

Okla., Oklahoma City—GROCERY HOUSE, ...etc.—Atchison, Topeka & Santa Fe Ry. Sys-...m, G. W. Harris, ch. engr., 80 E. Jackson ...Blvd., Chicago, Ill., bids soon wholesale ...rocery house and coffee roasting plant, ...North 35 and Santa Fe Sts. $175,000. ...Parr & Aderhold, 1200 Belford Ave., archts. ...Fleming Co., Inc., 3 E. Main St., lessee.

Pa., Gratz—FACTORY—Gratz Mfg. Co., c/o ...I. Reichman, Gratz, plans by William Lynch ...Murray, 11 North 2 St., Harrisburg, 2 story, ...2x245 ft. brick, cinder block shirt factory. ...$40,000.

Pa., Millersburg—FACTORY—Bixler Shirt ...Factory, Millersburg, plans by Fred Helwig, ...Millersburg, 2 story, 50x64 ft. brick factory. ...Over $40,000.

Pa., Pittsburgh — ASSEMBLY — J. W. ...Hoover, archt., Keystone Bldg., soon lets ...contract, 1 story, bsmnt., 34x100 ft., cement ...block and frame assembly bldg., for the ...Schnabel Co., J. A. Schnabel, chg., Bingham ...and Muriel Sts.

Tenn., Memphis—PLANT—Missouri Portland Cement Co., M. Moss Alexander, ...pres., 2511 Olive St., St. Louis, Mo., 750,000 ...bbl. cement plant, Thomas St. $2,500,000.

Tenn., Memphis—WAREHOUSE—Owner, ...c/o Raymond B. Spencer, archt., 1st Natl. ...Bank Bldg., steel sash warehouse, concrete ...fin. $80,000.

Tex., Dallas—COLD STORAGE PLANT—Merchants Cold Storage Co., 1301 Broom ...St., Dallas, cold storage plant addn., Broom ...and Yate Sts., $155,000.

Tex., Dallas—MACHINE SHOP—M. Rabinowitz, 3212 Elm St., machine shop. $40,-...000.

Tex., Fort Worth—STORAGE—F. Kent Motor Co., 100 E. Lancaster, plans by W. G. Clarkson & Co., First National Bank Bldg., ...rein.-con., steel storage bldg.

Tex., Lubbock—STORAGE—Ferguson Auto Supply Co., Lubbock, plans by Haynes & Strange, 415 Myrick Bldg., brick, steel, ...rein.-con. storage, shop and supply bldg., ...$40,000.

Tex., Lubbock — WAREHOUSE, etc. — Luther Transfer & Storage Co., Lubbock, ...plans by Haynes & Strange, 415 Myrick ...Bldg., 1 story, bsmnt., brick, title, rein.-con. ...warehouse and storage bldg. Over $40,000.

Tex., San Antonio—GRAIN DRYER—Liberty Mills, 903 Morales St., grain dryer, 87 ...ft. high, base of shaft 45x95 ft., rein.-con., ...steel. Over $40,000.

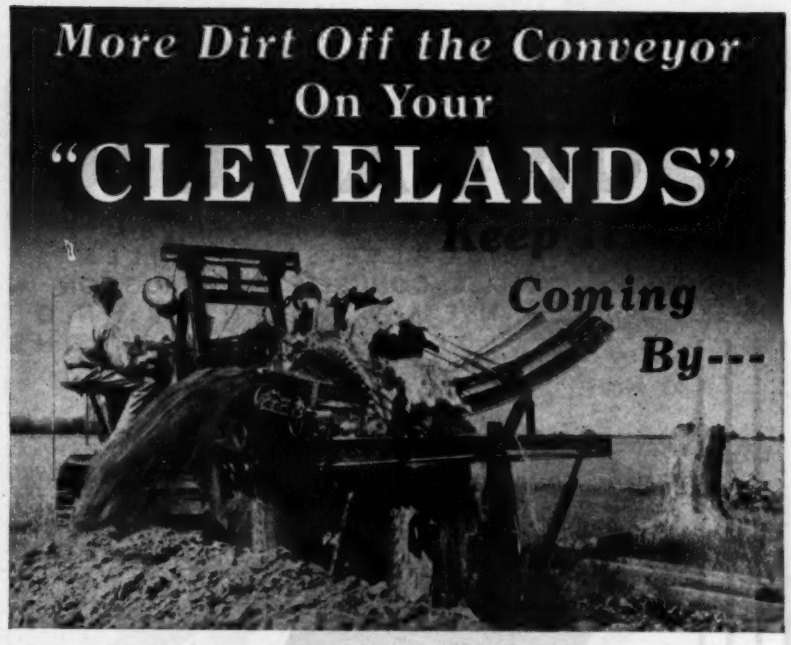
Tex., San Diego—RECYCLING PLANT—Duval Gasoline Co., San Diego, constructing, ...equip. recycling plant unit. Over $100,000.

Wis., Cudahy — STORAGE LOCKER PLANT—R. E. Oberst, archt., 2659 N. 27 ...St., Milwaukee, soon lets contract 1 story, ...87x87 ft. cold storage locker plant, for Cudahy Food Industries, Inc., 3113 E. Layton ...Ave.

B. C., Oyama—COLD STORAGE—Vernon Fruit Union, Vernon, plans by A. L. Patterson, Kelowna, cold storage plant. $134,000. ...CD 6/19—ENR 6/22.

B. C., Vancouver—PLANT—Rockfelt Products, Ltd., 308 Yorkshire Bldg., rock wool ...and other insulation and insulating materials ...mfg. plant. $50,000.

N. B., York Mills—MILL—Briggs & H. Little, York Mills, woolen mill. $50,000.



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● Lubricate thoroughly and regularly. When lubricating, make certain that all fittings are open and all bearings taking grease. Be sure to replace any broken or damaged fittings. ● When making spot lubrication, check machine for loose or broken bolts, broken strands in cables, worn or broken links in chain and worn brake and clutch facings, and replace at once all damaged parts. ● Check Crank Case Oil level. Fill to full mark. ● Check coolant in radiator. If contaminated, it should be changed. ● Check carefully all bucket rooters for sharpness. Renew when dull. This is exceedingly important and will pay dividends. ● Keep Conveyor belt tension as low as possible without allowing belt to slip. ● Check fan belt for tension . . . water pump and radiator for leaks. ● Examine all wiring. See that connections are tight, wires clean and not damaged. ● Operate digger with Boom Level when desired depth is reached. Never "crowd" machine ahead so that it "labors."

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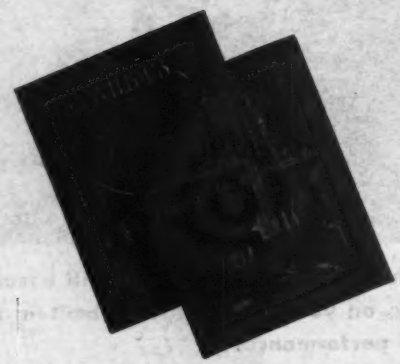

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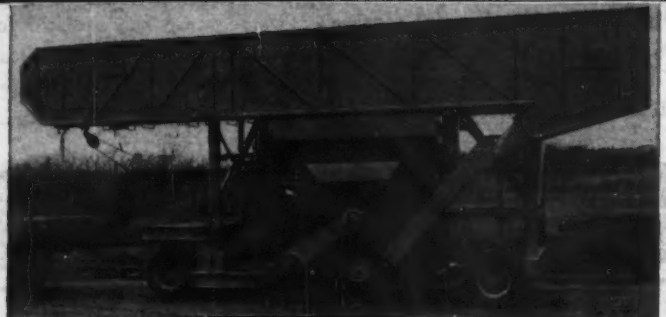

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INDUSTRIAL BLDGS. (Proposed Work, Cont'd.)

N. W. T., Yellowknife—DIAMOND DRILLING—Sun Bear Mines, Ltd., c/o Continental Securities Ltd., 57 W. Bloor St., Toronto, Ont., diamond drilling. Over $50,000.

N. W. T., Yellowknife—DIAMOND DRILLING—Nicholson Mines, Ltd., 25 W. King St., Toronto, Ont., diamond drilling program, $40,000.

Ont., Porcupine—DIAMOND DRILLING—Wilwood Gold Mines Ltd., diamond drilling, $40,000.

Ont., Red Lake—DIAMOND DRILLING—Heath Gold Mines Ltd., c/o Coin Lake Gold Mines, Ltd., 357 Bay St., Toronto, diamond drilling, Red Lake area, northwest Ontario, $60,000. W. P. Mackie, c/o owner, engr.

Ont., Richmond Hill—GRAIN ELEVATOR—Ramer & Son, 14 Center St., grain elevator, $40,000.

Ont., Simcoe—PLANT—Lealand Co., Ltd., Simcoe, processing and canning plant, $75,000.

Ont., Toronto—PLANT—Goodyear Tire & Rubber Co. of Canada, Ltd., Lake Shore Rd., altering plant. $48,120.

Ont., Toronto—WASHING HOUSE, etc.—Springer Sturgeon Gold Mines, Ltd., 67 Yonge St., washing house, storage facilities, conveyors sys., loading platform, etc., $300,000.

Que., Belleterre—DIAMOND DRILLING—Belleterre Gold Mines, Ltd., Belleterre, diamond drilling. $40,000. J. P. Norris, c/o owner, engr.

Que., Broughton Station—PLANT—Broughton Soapstone Quarry Co. Ltd., Broughton Station, plant. $47,000.

Que., Magog—PLANT—Fabrication des Foyers Mecaniques, 7 Champlain St., plant, Champlain St. $50,000.

Que., Montreal—FACTORY—Canada Dry Ginger Ale, Ltd., Royal Bank Bldg., plans by Luke & Little, 1410 Guy St., Montreal and W. M. Cory, 1775 Bway., New York, N. Y., factory and office bldg., Decarie Blvd. south of Cote de Liesse Rd. $150,000. CD 6/7—ENR 6/22.

Que., Montreal—FREIGHT SHED—Canada Steamship Lines, Ltd., 715 Victoria Sq., rebuilding freight shed. $350,000. B. R. Perry, 680 Sherbrooke St. W., engr.

Que., Montreal—PLANT—Pressure Die Casting Ltd., 2591 Notre Dame St. E., remodeling, exten. plant bldgs. $40,000.

Sask., Melville—PLANT—Swift Canadian Co., Ltd., 8 and Rose Sts., Regina, egg drying plant. $250,000.

BIDS ASKED

Bids Asked July 17

Ont., Toronto—PLANT—E. A. Cross, engr., 991 Bay St., 2 story, 40x140 ft. steel, brick plant addn., concrete fdn., for Selberling Rubber Co. of Canada, Ltd., 99 Patou Rd. $45,000.

Bids Asked July 18

Ia., Sibley—CREAMERY, etc.—Osceola County Co-op. Creamery Assn., Sibley, 1 and 2 story, 89x154 ft. brick, concrete block creamery bldg., concrete fdn., 1 and 2 story, 43x172 ft. milk dehydrating plant, tile, concrete fdn. Plans deposit $15 ea. project, Klinger, Hubbard & Gohn, 318 S. Barstow St., Eau Claire, Wis., engrs. and archts. CD 1/6—ENR 1/20.

Bids Asked

Que., Montreal—PLANT—Canadian Liquid Air Co. Ltd., 1111 Beaver Hall Hill, 1 story, 75x100 ft., brick plant addn., Viau and Rouen Sts. $75,000.

LOW BIDDERS

Md., Elkton—PLANT BLDGS.—Triumph Explosives, Elkton, June 30, 16 miscellaneous bldgs., from Frank H. Wilson, 118 Coulter Ave., Ardmore, Pa., $185,845. Whitman, Requardt, & Assoc., 1304 St. Paul St., Baltimore, archts. CD 6/22—ENR 6/29.

CONTRACTS AWARDED

★**Calif., Barstow**—SERVICE—Atchison, Topeka & Santa Fe. Ry. System, G. W. Harris, ch. engr., 80 E. Jackson Blvd., Chicago, Ill., 1 story, 138x225 ft. diesel locomotive service bldg., steel frame, corrugated siding, to Swinerton & Walberg Co., 805 W. Olympic Blvd., Los Angeles. Approx. $850,000. CD 5/23—ENR 5/25.

★**Ky., Louisville**—CHEMICAL PLANT—B. F. Goodrich Co., 500 S. Main St., Akron, O., design and construction chemical plant mfg. vinge chlorid reserv., to Austin Co., 16116 Euclid Ave., Cleveland, O. Est. $1,200,000.

Mich., Battle Creek—FREIGHT HOUSE—Grand Trunk Ry. Co., c/o Canadian National Rys., H. A. Dixon, ch. engr., Montreal, Que., 32x360 ft., brick, steel, concrete freight house, to Miller Davis Co., 1919 Factory St., Kalamazoo. Est. $55,000.

Mich., Jackson—FACTORY—Kelsey Hayes Wheel Co., Jackson, 66x260 ft., brick, steel factory addn., to J. A. Krausmann & Co., 1460 E. Jefferson Ave., Detroit. Est. approx. $70,000.

Minn., Perham—DEHYDRATING PLANT—Land O'Lakes Dairy Co., subsidiary Land O'Lakes Creameries, Inc., L. L. Getten, production mgr., 2201 Kennedy St. N.E., Minneapolis, general contract 2 story, 92x130

INDUSTRIAL BLDGS. (Contracts Awarded, Cont'd.)

... and 24x31 ft. milk dehydrating plant, ... tile to Scott Elstad, Perham, Minn., ... Independence, Wis. Est. total cost incl. ... $275,000. CD 2/16—ENR 2/24.

...O., Elyria — FACTORY — General Indus... Elyria, 1 story, 60x180 ft., brick, steel ... plant, to Hadlock Krill Co., 2189 E. 23 ... factory, to Hadlock Krill Co., 2189 E. 23 ... Cleveland. Est. $50,000. George S. ... Tower Co., Terminal Tower, Cleveland, archts.

Tex., Edinburg—COLD STORAGE PLANT ... E. Fitzpatrick, N. State Hy., 1 story, ... brick, rein.-con., 250 lockers, etc., cold stor... plant, to Valley Weathermakers, Harlin... approx. $40,000. CD 4/7—ENR 4/13.

Tex., Harlingen—WAREHOUSE—H. E. ... Co., Corpus Christi, 1 story, concrete ... warehouse, concrete fdn., force account ... charge of W. E. Simpson Co., engr., ... Bldg., San Antonio. $40,000. CD ...21—ENR 6/8.

Tex., Houston — WAREHOUSE — Reed ... Bit Co., Navigation and Mack Sts., ...x115 ft., brick, rein-con. steel, etc. ware... to Mosher Steel Co., Washington St., ... $40,000.

Tex., Houston—SHOP—Schlumberger Well ... Co., 2729 Lesland St., 1 story, ... brick, hollow tile, steel frame shop unit, ... fdn., etc., to Tellepsen Constr. Co., ... Clay Ave., $40,000.

Man., Brandon—PLANT—A. E. McKenzie ... Co., North St. and Pacific Ave., 5 ... story, bsmnt., rein.-con., brick, tile plant ... 9 St. and Pacific Ave., to Claydon Co., ... 290 Garry St., Winnipeg, about ...,000. CD 5/10.

Man., Winnipeg—BUS DEPOT—Winnipeg ... Co., Notre Dame and Albert Sts., ...x152 ft., brick, rein.-con. bus depot addn., ... Ave., to Commonwealth Constr. ... Ltd., Royal Bank Bldg., $60,000.

Ont., Chatham—PLANT—DeKalb Hybrid ... Ltd., 114 St. Clair St., plant, to Dins... ...-McIntire, Ltd., Windsor, $150,000. CD ...—ENR 622.

Ont., Malton—STORAGE—Victory Aircraft ... Malton, inflammable storage bldg., to ... & Nicholls, Ltd., 57 B. Bloor St. W., ... $40,000.

Ont., Temiskaming—PLANT—Canadian In... Paper Co., Ltd., Sun Life Bldg., ... Que., pulp storage plant addn., to ... Pratt, Ltd., 30 Bloor St. W., Toronto, ...,000.

Que., Jonquiere — PLANT DAM — Price ... Co., Ltd., 65 Ste. Anne St., Quebec ... replacing existing wooden dam with ... dam, to Anglin-Norcross Quebec ... 892 Sherbrooke St. W., Montreal, $65,... CD 5/19—END 5/25.

Que., Quebec City—PLANT—Bennett, Ltd., ... plant, to E. Frenette, Ltd., 75 St. ... St. Est. $40,000. R. Blanchet, 53 ... Arteuill St., archt. CD 4/27.

Sask., Estevan—PLANT—Canada Packers ... 226 Pacific St., Saskatoon, plant, to ... Constr. Co., Ltd., 502 5 Ave., ... Est. $100,000.

UNCLASSIFIED

PROPOSED WORK

Calif., San Bernardino—TRACKAGE—Pa... Electric Ry. Co., E. C. Johnson, chf. ... Pacific Electric Bldg., Los Angeles, ...ten. trackage east on Rialto Ave., incl. ... timber bridge. $75,000.

Fla., Richmond—RUNWAYS, etc.—Yards ... Docks, Navy Dpt., 18 St. and Constitu... Ave. N.W., Wash., 25, D. C., architec... and engineering services by Bail, Hor... Assoc., 401 W. Adams St., Jackson... runways and parking area, Naval Air ... CD 4/14—ENR 4/27.

Ia., Humboldt—SWIMMING POOL—City, ... House, mayor, City Hall, special elec... $35,000 bond issue, swimming pool.

Kan., Abilene — AIRFIELD — City, W. ... mayor, City Hall, special election to ... $50,000 bond issue, airport. Approx. ...000.

La., Homer—GASOLINE PIPELINE—... Natural Gas Co., Sterick Bl., Mem... Tenn., 48½ mi. 12¾ in. welded joint ... gasoline pipeline carrier. Over ...

Me., Lewiston — PLAYGROUNDS — City, ... Myhrman, comr. Playgrounds, City ... completing plans, bids soon construct... equipping playgrounds. $125,000.

Minn., Detroit Lakes—HANGAR—City, E. ... Bestick, clk., 3- or 4-plane hangar at air... Over $25,000. W. Larson, city engr.

Minn., Redwood Falls—AIRPORT—City, F. ... Forbes, clk., plans election to vote on ... issue, acquiring site, constructing air... Over $25,000. E. W. Edwards, city ... P. C. Bettenburg & Co., 1437 Marshall ..., St. Paul, consult. engrs.

Nebraska—TRANSMISSION LINES—Con... Pub. Power Dist., Scottsbluff, 172 mi. ... lines, vicinity Lexington. $150,...

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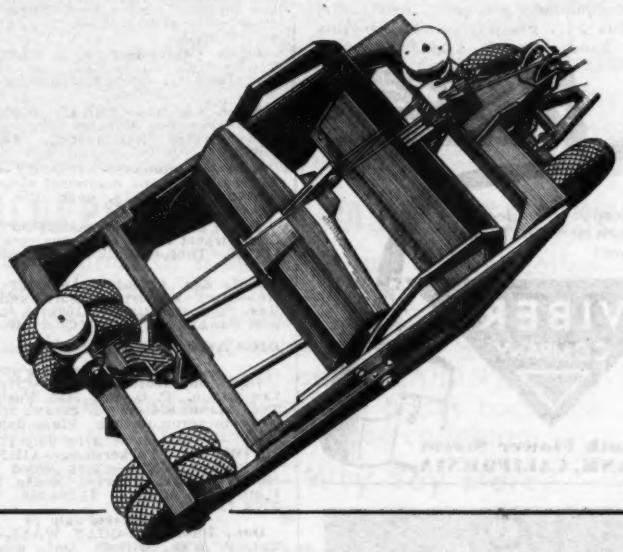

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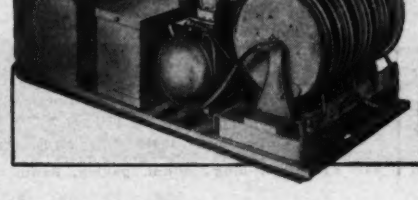

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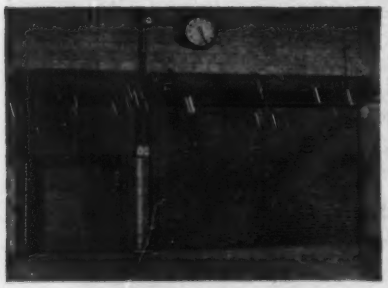

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UNCLASSIFIED (Proposed Work, Cont'd.)

★†**O., Blue Ash**—LANDING FIELD, etc.—City of Cincinnati, Hamilton Co. and Civil Aeronautics Admin., City Hall, Cincinnati, landing field, runways, fencing, roads, sodding, grading, lighting. $3,371,387.

O., Bowling Green—HANGAR—Bowling Green State University, Bowling Green, hangar at Bowling Green State University airport. $66,000.

†**O., Cleveland**—REFRIGERATION, etc.—National Advisory Com. Aeronautics, E. R. Sharpe, administration mgr., Cleveland Airport, making plans refrigeration, piping sys., alterations in engine research bldg. $25,000. B. D. Gulick, c/o owner, engr. CD 6/21—ENR 6/22.

Oklahoma—OIL PIPELINE—British American Oil Producing Co., 1st Natl. Bldg., Oklahoma City, 6 in. oil pipeline from Jordan oil well northeast from Arcadia to railroad loading dock at Arcadia. $25,000.

Oklahoma, Kansas, etc.—GAS PIPELINE—Pacific Lighting Corp., 433 California St., San Francisco, Calif., 1,000 mi. 36 in. natural gas pipeline carrier from Hugoton field of Oklahoma and Kansas to Pacific coast. $45,000,000.

South Carolina—RURAL ELECTRIFICATION—Blue Ridge Electric Cooperative, Pickens, rural electrification. $50,000. REA allot.

South Carolina—RURAL ELECTRIFICATION—Pee Dee Electric Cooperative, Darlington, rural electrification. $35,000 REA allot.

S. D., Lemmon — AIRPORT — Approved $25,000 bond issue municipal airport. Julian Steven, Rapid City, engr. CD 3/29—ENR 4/6.

Tex., San Antonio—AIRPORT BLDG—City, airport repair shop, concrete floors, etc. $40,000. Thos. Coghill, c/o City Eng. Branch, engr.

Tex., San Antonio—AIRPORT HANGAR, etc.—Hurt Airport, Culebra and Callahan Rds., reconstructing 75x100x255 ft. steel airport hangar and shop. Over $40,000.

BIDS ASKED

Bids Asked After July 15

†**Ark., Jonesboro**—APRON—Civil Aeronautics Admin., P. O. Box 1689, Fort Worth, 1, Tex., apron, 926 cu. yd. excav., 3,333 sq. yd. concrete apron paving. Plans deposit $10.

Bids Asked After July 16

★†**W. Va., Parkersburg**—AIRPORT IMPROVEMENTS—Clerk Wood Co., Court House, airport imprvs., Route 2, approx. 8 mi. north of here. $1,600,000. CD 6/29—ENR 7/6.

Bids Asked July 18

Ont., Hamilton—QUAY WALL—Secretary Dpt. P. Wks., Ottawa, Ont., quay wall in front H.M.C.S. Star. $75,000.

Bids Asked After July 19

†**W. Va., Wheeling**—AIRPORT GRADING, etc.—Bd. Comrs., Ohio Co., County Bldg., airport grading, drainage, paving runways 150x4500 ft. and 150x4500 ft., at Short Creek. $400,000. CAA. CD 3/13—ENR 3/16.

Ont., Oshawa—AERODROME — Secretary Dpt. Transport, Ottawa, addnl. development aerodrome, mainly addnl. parking area, drainage. $35,000.

Bids Asked July 21

†**Md., Patuxent River (br. Wash., D. C.)**—SEAPLANE DOCKING BASIN—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., seaplane docking basin, Naval Air Station, NOY 9115.

Bids Asked August 2

★**B. C., New Westminster**—FISH LADDERS, etc.—International Pacific Salmon Fisheries Comn., Dominion Bldg., fish ladders and channel work in Hell's Gate Canyon, Fraser River. $2,000,000. CD 2/28—ENR 3/2.

LOW BIDDERS

†**Calif., Benicia**—SPRINKLER SYSTEM—U. S. Eng., 74 New Montgomery St., San Francisco, installing sprinkler sys., at Benicia Arsenal, from C. M. Robinson & Co., 451 Folsom St., San Francisco. $206,276.

Calif., Long Beach—PIER—City Harbor Dpt., 1333 El Embarcadero, June 30, imprv. Pier A, Spec. HD 170, from Owl Truck & Materials Co., 420 South Alameda St., Compton, $105,148. CD 6/21.

★†**Calif., Muroc**—AIRFIELD IMPRVS., etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, ••• addnl. water supply sys., Inv. 663, from Edward R. Sipple Co., 2545 San Fernando Rd., Los Angeles, $32,029••• installing, constructing hangar doors for 2 depot supply hangars, Inv. 667, from Fred D. Kyle, 516 W. 5 St., Los Angeles, $129,787, all at Army Airfield. CD 5/24—ENR 6/1.

†**Calif., San Diego**—AIR STATION BLDG.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., June 30, furnishing, erecting structural steel for engine overhaul bldg., Naval Air Station, Spec. 14059, NOV. 9540, from Consolidated Steel Co., 5700 Eastern Ave., Los Angeles, $148,300.

†**Calif., Santa Rosa**—AIRFIELD BLDG., etc.—U. S. Eng., 74 New Montgomery St., San Francisco, bldg., addnl. paving, Santa Rosa Army Air Base, Job Nos. 1601, 1602 and 1640, from Wm. D. Rapp, 705 Bennett St. $230,734.

†**Calif., Van Nuys**—HANGAR, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, hangar, miscellaneous bldgs., paving, utilities, Metropolitan Airport, Inv. 453, from Jackson Bros., 547 S. Fairfax, Los Angeles, $346,857.

★†**Ill., Decatur** — AIRPORT — Civil Aeronautics Admin., 608 S. Dearborn St., Chicago, July 7, airport, 3 concrete runways, underdrains, storm sewers, fencing, etc., from M. J. Boyle & Co., 1744 N. Mozart St., Chicago, concrete work. $1,307,539. CD 6/29.

†**Pa., Middletown**—AIRPORT BLDG.—U. S. Eng., Standard Oil Bldg., Baltimore, Md., June 30, headquarters Bldg. at Middletown Airport, from Haris Constr. Co., 26 Court St., Brooklyn, 2, N. Y., $138,500.

★†**Ia., Waterloo**—AIRPORT RUNWAYS—Civil Aeronautics Admin., 410 E. 12 St., Kansas City, Mo., July 1, airport runways, Proposal No. 5 P-44-338, from Concrete Materials Constr. Co., 405 Granby Bldg., Cedar Rapids, asphalt $1,188,020; from Central Engineering Co., 3531 Rockingham St., Davenport, concrete $1,337,003. CD 6/21—ENR 12/2.

†**Louisiana** — AIRPORT PAVING, etc.—U. S. Eng., 25 St. and Avenue F, Galveston, Tex., addnl. paving, parking and runway exten., Moisant Airport at Kenner, near New Orleans, Sol. No. 41-243-44-C199, from T. L. James & Co., Ruston. $207,005. CD 6/21—ENR 6/29.

†**Md., Patuxent River** (br. Wash., D. C.)—AIR STATION BLDG.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., July 5, ships service store addn., Naval Air Station, NOY 9215, from Irons & Reynolds, Inc., Barr Bldg., Wash., D. C., $173,557. CD 6/21—ENR 6/29.

★†**Pennsylvania** — AIRPORT BLDGS. — U. S Eng., Standard Oil Bldg., Baltimore, Md., military housing, paving, grading, utilities, runways, taxi strip, water sys., sanitary sewage sys., water tower, airfield gas sys., electric distr. sys. from Mellon Stuart Co., 210 E. Parkway, Pittsburgh, $848,543; hangar, from The Trimble Co., 1719 Pennsylvania Ave. N.W., Pittsburgh, $63,198. CD 6/21—ENR 6/8.

†**Tex., Dalhart**—TAXIWAY—U. S. Eng., 416 Wright Bldg., Tulsa, 2, Okla., June 14, reinforced paving and new taxiways, Sol. 34-066-44-113, from Standard Paving Co., 2119 E. 11 St., Tulsa, Okla. $219,002. CD 6/26—ENR 7/6.

★†**Va., Langley Field**—AIRPORT RUNWAYS, etc.—U. S. Eng., Fort Norfolk, Norfolk, June 26, runways, taxiways, parking apron, from T. E. Ritter Co., 424 W. York St., Norfolk. $1,941,563. CD 6/14—ENR 6/22.

†**Tex., Laredo**—POORMAN RANGES—U. S. Eng., Fort Sam Houston, Poorman ranges, 103 firing positions, incl. concrete slabs and bases for turrets, timber supports for sighting devices, etc., from Cunningham & Dina, 2024 N. St. Marys St., San Antonio. $86,935 CD 6/23—ENR 7/6.

CONTRACTS AWARDED

†**Arizona and California** — TRACKAGE REMOVAL—U. S. Eng., 751 S. Figueroa St., Los Angeles, 14, Calif., removing existing railroad trackage from railheads at Yuma and Hyder, Ariz., and at Glamis and Ogilby, Calif., Inv., 662, to Shannahan Bros., 6191 Maywood Ave., Huntington Park, Calif., $30,863. Awarded 6/27.

†**Ariz., Kingman**—TARGET RANGE—U. S. Eng., 751 S. Figueroa St., 14, Calif., Poorman type target range at Army Airfield, No. 599, to Allied Contractors, 9700 N. Pico Blvd., Los Angeles, Calif., $182,000. Awarded 7/3.

†**Ariz., Yuma**—TARGET RANGE—U. S. Eng., 751 S. Figueroa St., Los Angeles, 14, Calif., Poorman type target range, Army Air Field, No. 590, to H. B. Nicholson, 571 Chamber of Commerce Bldg., Los Angeles, Calif., $117,400. Awarded 7/3.

†**Calif., Arcata**—AVIATION FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., aviation facilities, Auxiliary Air Station, NOY 9662, to Fred J. Maurer & Sons, 369 Pine St., San Francisco, $456,500. CD 4/17—ENR 4/27.

†**Calif., Hamilton Field**—NIGHT LIGHTING SYSTEM—U. S. Eng., 74 New Montgomery St., San Francisco, Zone 19, night lighting sys., Spec. 1555-1, to L. H. Leonard Electric Co., 1010 D St., San Rafael. $109,000.

★†**Calif., Los Alamitos**—RUNWAYS, etc.—Yards & Docks, Navy Dpt., 18 St. and Constituton Ave. N.W., Wash., 25, D. C., addnl. runways, taxiways, and plane parking areas, Auxiliary Air Station, NOY 10688, to United Concrete Pipe Co., P. O. Box 1, Station H, Los Angeles, Zone 44, $506,000. CD 7/5, under LB.

†**Calif., McClellan Field** — AIRFIELD BLDGS.—U. S. Eng., 1209 I St., Sacramento, Zone 3, cafeteria and time clock bldg., Spec. 913, to Lawrence Constr. Co., 3020 V St., Sacramento, $42,004; motor repair bldg., Spec. 913, to Campbell Constr. Co., 800 R St., Sacramento, $48,000.

CLASSIFIED (Contracts Awarded, Con.)

*Calif., March Field (br. Riverside)—AIRFIELD BLDGS.—U. S. Eng., 751 S. Figueroa Los Angeles, Zone 14, addnl. bldgs., No. to Weymouth-Crowell Co., 2104 E. 15 Los Angeles, $65,270. Awarded 7/3.

*Calif., Maywood—UNDERGROUND FACILITIES—U. S. Eng., 751 S. Figueroa St., Angeles, Zone 14, installing underground facilities, Army Air Force Supply Depot, to O'Neal & Hedberg, 852 S. Robertson Blvd., Los Angeles, $131,250. Awarded

*Calif., Muroc—AIRFIELD BLDGS., etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, officers' quarters, No. 652, to Stratford Constr. Co., 3537 E. Colorado Blvd., Pasadena, $118,655; furnishing, fabricating structural steel for supply hangars, Inv. 14, to Consolidated Steel Corp., 5700 S. Alameda Ave., Los Angeles, $115,000, both at Army Airfield. CD 7/5, under LB.

*Calif., Muroc—LANDING FIELD FACILITIES—U. S. Eng., 751 S. Figueroa Los Angeles, Zone 14, addnl. landing field facilities, at Army Air Field, No. 660, to Peter Kiewit & Sons Co., 650 S. Grand Ave., Los Angeles, $6,634,167. CD 7/5, under LB.

*Calif., Muroc—HANGARS—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone hangars at Army Air Field. Job No. to R. J. Daum, 6803 West Blvd., Los Angeles, $923,803. CD 7/6, under LB.

*Calif., Rialto—EXPLOSIVE HOLD YARD U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, explosive hold yard, A.B.U.S.P. Inv. to Shannahan Bros., 6193 Maywood St., Huntington Park, $274,695. Award 6/28.

*Calif., San Diego—MOCK-UP RAMP and DOCK—Yards & Docks, Navy Dpt., 18 St. & Constitution Ave. N.W., Wash., 25, D. C., mock-up ramp and dock, NOY 9750, Case Constr. Co., Box G, Coronado, $4,165.

*Calif., Santa Ana—PARKING APRON—U. S. Eng., 751 S. Figueroa St., Los Angeles, Zone 14, parking apron, Army Airfield, Inv. to N. A. Moore, 2951 W. Valley St., Alhambra, $27,029. Awarded 6/27.

Colorado and Utah—GRADING—Denver & Rio Grande Western R. R. Co., A. E. Perlee, ch. engr., Rio Grande Bldg., Denver, Colo., 250,000 cu.yd. grading at 12 different locations, western Colorado and eastern Utah, to Lowdermilk Bros., 112 South Elati St., Denver, Colo., $185,000. Bids 6/5. CD 6/6—ENR 5/18.

*Colo., Fitzimons (br. Denver)—GRADING RUNWAYS—Aero Enterprise, Inc., Mack Bldg., grading runways for private airport, 5 mi. east of here, to Peter Kiewit Sons Co., 1099 South Logan St., Denver, $68,600. Decker & Ryan, 1st Natl. Bank Bldg., Denver, engrs.

*Colo., Pueblo—AIR BASE BLDGS.—U. S. Eng., 909 17 St., Denver, trainer bldgs., electric distr., etc., Pueblo Army Air Base, Contr. 05-016-eng-215, to R. E. Wear & Son, Montrose, $25,586. CD 6/9.

*Del., Dover—AIR FIELD HOUSING, etc.—U. S. Eng. Penn Mutual Bldg., 6 and Walnut Sts., Phila., 3, Pa., housing utilities, Army Air Field, Contr. 36-109-eng-589, to Rupert Constr. Co., 1509 French St., Wilmington, $40,700. CD 6/29—ENR 7/6.

*Del., Newark—ELECTRICAL DISTRIBUTION SYSTEM, etc.—U. S. Eng., Penn Mutual Bldg., 6 and Walnut Sts., Phila., Pa., electrical distr. and lighting protective systems, Contr. 36-109-eng-707, to McGrath Electric Co., 211 W. 8 St., Wilmington, $9,458.

*Fla., Boca Raton—PARKING APRONS, etc.—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, parking aprons, training facilities, to Brinson Constr. Co., Caesar and Cumberland Rds., Tampa, $203,000.

*Fla., Miami—SPRINKLER SYSTEM, etc.—U. S. Eng., 575 Riverside Ave., Jacksonville, Zone 2, sprinkler sys., and exterior lighting at 36 St. Airport, Contr. 08-123-eng-6, to Globe Automatic Sprinkler Co., 1331 Washington Ave., Phila., Pa., $30,260.

*Fla., Tyndall Field—TARGET RANGES U. S. Eng., Grant St. west of Westwood Mobile, Ala., converting target ranges, Contr. 01-076-eng-593, to Henderson-Black Greene Mill Co., Troy, $46,141.

*Ill., Chicago—AIRFIELD BLDGS.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl. general construction Naval Training Schools, Naval Pier, NOY 10155, to William R. Goss 435 N. Michigan Ave., Zone 11, $84,445. Bid 6/13—ENR 4/27.

*Kan., Topeka—AIR STATION BLDGS., etc.—U. S. Eng., 10 E. 17 St., Kansas City, Mo., addnl. bldgs., incl. warehouses, utilities, railroad spur, Army Air Depot, to Kent. J. Green, Manhattan, $934,059. CD 7/1.

*La., Shreveport—POORMAN GUNNERY RANGES—U. S. Eng., 300 Bway., Little Rock, Ark., Poorman gunnery ranges, grounds development, etc., Sol. 03-050-44-102, to Lavasseur and Allen, Alexandria, La., and Burton Pollard, 2011 E. Tex. St. BC. Shreveport, $87,418.

*Mass., Bedford—PARKING APRON—U. S. Eng., 31 St. James Ave., Boston, concrete parking apron, No. 19-033-44-Neg-224, to Central Constr. Co., 265 Beacon Ave., Lawrence, $186,440. Bids 6/28.

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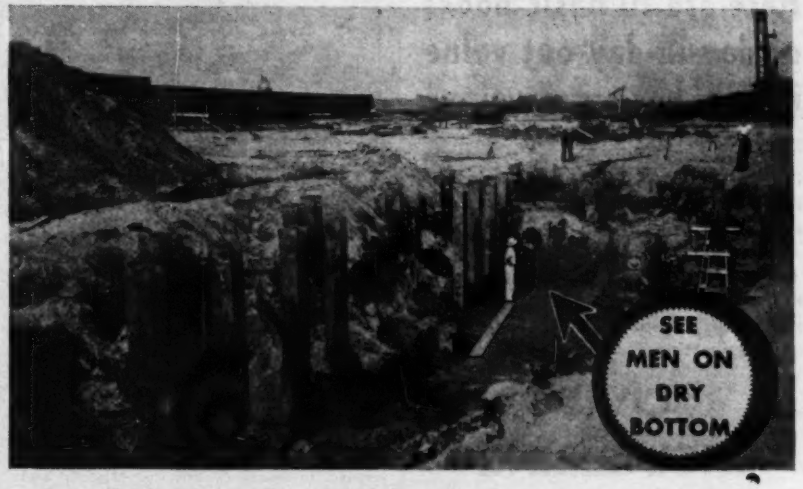

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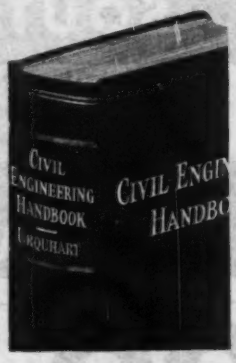

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†**Mass., South Boston (Sta. Boston)**—OXYGEN DISTRIBUTION PIPING SYSTEM, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., oxygen distr. piping sys., N.D.D., NOY 9990, to V. J. Kenneally Co., 104 S. Hanover St., Boston, $33,712; industrial gas distr. sys., Navy Yard, N D D, NOY 9091, to Cleghorn Co., 121 Arlington St., Boston, $41,482.

†**Mass., Westover Field (Sta. Chicopee Falls)**—AIRFIELD BLDGS., etc.—U. S. Eng., 319 Industrial Trust Bldg., Providence, R. I., Poormans flexible gunnery type trainer bldgs., to E. J. Pinney Co., Inc., 220 Dwight St., Springfield, $27,000. CD 6/8 ENR 6/15; training tank No. 19-022-44-Nag 232, Army Air Corps, to J. G. Roy & Sons Co., 21 Silver St., Springfield, $43,380, CD 6/30—ENR 7/6.

★†**Neb., Fort Crook**—AIRFIELD IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, airfield imprvs., strengthening runways, constructing shoulders, paving, etc., to Peter Kiewit Sons Co., 1024 Omaha National Bank Bldg., Omaha, and Western Contracting Corp., 2100 E. 4 St., Sioux City, Ia., $1,324,141. CD 5/31—ENR 6/8.

†**Neb., Grand Island**—AIRBASE BLDGS.—U. S. Eng., 1709 Jackson St., Omaha, bldgs., at airbase, to Korshoj Constr. Co., Blair, $28,000.

†**Neb., Lincoln**—AIRBASE IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, airbase imprvs., to Abel, Dobson & Robinson, 900 N. 16 St., $410,000.

†**Neb., McCook**—AIR BASE BLDGS.—U. S. Eng., 1709 Jackson St., Omaha, bldgs., at airbase, to Roush Constr. Co., McCook, and Korshoj Constr. Co., Blair, $29,200.

†**Nev., Las Vegas**—TARGET RANGE—U. S. Eng., 751 S. Figueroa St., Los Angeles, 14, Calif., Poorman type target range, Army Airfield, No. 598, to General Constr. Co., & Walter Johnson, 6205 Hollywood Blvd., Los Angeles, Calif. $248,900. Awarded 7/3.

†**N. J., Bayonne**—DRY DOCK POWER and WELDING SERVICE ALTERATIONS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., altering power and welding service, Dry Dock 7, Navy Yard, Bayonne Annex, NOY 10286, to Hatzel & Buehler, Inc., 420 Lexington Ave., New York, N. Y., $38,000.

†**N. J., Millville**—APRON, etc.—U. S. Eng., Penn Mutual Bldg., 6 and Walnut Sts., Phila., Pa., addnl. apron, roads, paving and walks, Millville Army Air Force, Contr. 36-109-eng-695 and 36-109-eng-692, to Union Paving Co., 1227 N. Broad St., Phila., Pa., $161,339.

†**N. Y., Brooklyn**—GAS LINE REPLACEMENT, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., replacing gas, air, sewer and water lines, Navy Yard, NOY 10174, to Raisler Corp., 120 Amsterdam Ave., New York, $99,477; repairing steam and air lines, Piers G, J and K, Navy Yard, to Afgo Engineering Corp., 147 Fulton St., New York, $159,583.

†**N. Y., North Beach**—AIR FIELD BLDG.—U. S. Eng., 130 Wall St., New York, Zone 5, temporary frame bldg., LaGuardia Field, Contr. 30-075-eng-1514, to Wilcox Constr. Co., Inc., 25-20 41 Ave., Long Island City, $69,580.

†**N. Y., Schenectady**—OPEN STORAGE AREA—U. S. Eng., Chimes Bldg., Syracuse, addnl. open storage area, Contr. W-30-130-eng-234, to Sheehan Contg. Corp., 446 2 St., Albany, $62,680.

†**North Carolina**—AIRPORT PAVING, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl. airport paving, parking area, incl. grading, Naval Auxiliary Air Station, Harvey Point, NOY 9914, to Y. L. Brown, 4800 E. Princess Anne Rd., Norfolk, Va., $53,650.

†**N. C., Edenton**—AIR STATION CELESTIAL NAVIGATION TRAINERS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., bldg. to house 2 celestial navigation trainers, Marine Corps Air Station, NOY 10171, to V. P. Loftis Co., Builders Bldg., Charlotte, $30,276.

†**N. C., Elizabeth City**—FIELD LIGHTING—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., field lighting, NOY 7797, to Tuck & Kendall, Inc., Indian River Rd. at Wilson Rd., Norfolk, Va., $49,874.

★†**N. D., Jamestown**—AIRPORT—Civil Aeronautics Admin., 608 S. Dearborn St., Chicago, Ill., grading, paving, fencing, etc., airport, to W. H. Noel, Jamestown, $979,604. CD 2/17/43—ENR 2/22/43.

O., Barberton—FIRE SIGNAL SYSTEM—City, R. K. Dobbs, mayor, installing fire signal sys., to Gamewell Co., Park Bldg., Pittsburgh, Pa., $47,882. CD 5/11—ENR 5/18.

†**O., Ravenna**—STORAGE AREA, etc.—U. S. Eng., 925 New Federal Bldg., Pittsburgh, Pa., storage area, service road, addnl. facilities, etc., Ravenna Ordnance Wks., Contr. 36-058-eng-920, to The Hunkin-Conkey Constr. Co., 1740 E. 12 St., Cleveland, $385,027.

†**Okla., Norman**—APRONS, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., constructing and paving aprons and parking areas, Naval Air Station, NOY 9666, to Standard Paving Co., 2119 E. 11 St., Tulsa, $44,611.

†**Tenn., Dyersburg**—AIR BASE BLDGS.—U. S. Eng., Grant St. west of Westwood St., Mobile, Ala., trainer bldgs., utilities, Contr. 01-076-Eng-597, to E. O. Koonce Constr. Co., Porter Bldg., Memphis, $32,900.

†**Tex., Abilene**—WATERPROOFING, etc.—U. S. Eng., Fort Sam Houston, waterproofing, sealing runways at Army Air Field, to J. F. Malcolm, Bishop, and Cage Bros., Abilene, approx. $25,000. Bids 7/1.

Tex., Carthage—GAS PIPELINE—Feazel & Kinsey, Comm. Natl. Bank Bldg., Shreveport, La., laying 7 mi. 6 in. welded joint gas pipeline carrier, force account. Approx. $46,000. Est. $50,000. CD 7/5—ENR 7/13.

†**Tex., Corpus Christi**—AIR STATION BLDGS.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., 5 standard BIB barracks, Naval Air Station, NOY 9511, to Thomas Bate & Sons, 1107 Gerard St., Houston, Zone 10, $159,200.

†**Tex., Corpus Christi**—PARKING AREA, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., addnl. airplane parking area and runway exten., to Aikin & Hinman, Box 2250, Corpus Christi, approx. $25,000.

†**Tex., Dalhart**—ADDITIONAL FACILITIES—U. S. Eng., 416 Wright Bldg., Tulsa, 3, Okla., addnl. facilities, Contr. 34-044-Eng-240, to G. Fred Anderson, H. M. Hoss & Patterson Steel Co., 301 N. Xanthus St., Tulsa, Okla., $245,450. CD 6/14—ENR 6/22.

†**Tex., El Paso**—AIRPORT BLDG.—U. S. Eng., Albuquerque, N. M., addnl. trainer bldg., to Rob. E. McKee, 1113 Texas St., El Paso, approx. $25,000.

†**Tex., El Paso**—HANGAR, etc.—U. S. Eng., Albuquerque, N.M., 200x225 ft. hangar, addnl. facilities, to J. E. Morgan & Sons, 210 N. Campbell St., $179,360. CD 6/21—ENR 7/6.

†**Tex., Harlingen**—POORMAN RANGES—U. S. Eng., 25 St. and Avenue F, Galveston, Poorman ranges at Harlingen Airfields, to Dodds & Wedegartner, 302 N. Bowie St., San Benito, $85,000.

Tex., Laredo—AIRFIELD BLDGS., etc.—U. S. Eng., Fort Sam Houston, gun camera bldg., crash truck station for airfield, to L. Christy, 503 American Hospital & Life Bldg., San Antonio, $27,066. Est. $40,000.

†**Tex., Victoria**—RUNWAY—U. S. Eng., 25 St. and Avenue F, Galveston, repairing runway at Aloe Field, to E. B. Darby, Pharr, $45,000.

†**Va., Dahlgren**—BOAT PIER, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., small boat pier, facilities, Naval Proving Ground, NOY 7791, to Vinton Constr. Co., 908 Gist Ave., Silver Spring, Md., $33,030. CD 2/3—ENR 2/10.

★†**Washington**—RAILROAD, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., railroad, 2nd increment, ammunition storage and transshipment facilities, Puget Sound Navy Yard area, NOY 9491, to Sound-Kiewit, 1403 W. 45 St., Seattle, Zone 7, $2,156,217. CD 6/8—ENR 6/15, under LB.

★†**Wash., Bangor**—MARGINAL WHARF—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., marginal wharf, Naval Magazine, NOY 9402, to Manson Constr. & Engr. Co., 821 Alaskan Way, Seattle, Zone 4, $604,200. CD 6/15—ENR 6/22, under LB.

★†**Wash., Boeing Field (P. O. Seattle)**—PARKING APRON, etc.—U. S. Eng., 200 3 Ave., Seattle, Zone 4, addnl. parking apron, taxiways, installing floodlighting, to N. Piorito Co., 844 W. 48 St., Seattle, $1,644,658. CD 6/13—ENR 6/15.

†**Wash., Bremerton**—AIR STORAGE and TRANSSHIPMENT DEPOT DRILLING and DEVELOPMENT—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., drilling, development, Naval Air Storage and Transshipment Depot, Puget Sound Area, NOY 9742, to N. C. Jannsen Drilling Co., P. O. Box 3185, Seattle, $26,800.

†**Wash., Seattle**—RECREATIONAL FACILITIES—U. S. Eng., 800 Third Ave., recreation facilities at Seattle Port of Embarkation Depot, to A. W. Johnson Co., Inc., 208 E. Pacific St., $40,024. Awarded 6/28.

†**Wash. Whidbey Island (br. Seattle)**—AIR STATION CELESTIAL NAVIGATION TRAINERS—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., 25, D. C., 2 celestial navigation trainers, Naval Air Station, NOY 10161, to Western Constr. Co., Textile Tower, Seattle, $50,920.

†**Wash., Seattle**—SPRINKLER SYSTEM—U. S. Eng., 800 Third Ave., installing sprinkler sys., at Mt. Rainier Ordnance Depot, to Grinnell Co. of the Pacific, Elliott Ave and Bay St., $37,275. Awarded 6/28.

B. C., North Vancouver—PIER DECKING, etc.—Midland Pacific Terminal, Ltd., 1921 Marine Bldg., Vancouver, replacing pier decking and tower supports for overhead gallery, to Commonwealth Constr. Co., Ltd., 670 Taylor St., Vancouver, $75,000. Awarded 7/3. CD Howe & Co., Port Arthur, Ont., engr.

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Postwar Projects see p. 179

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